Heating Piping & Air Conditioning

MARCH 1954

INDUSTRIAL • COMMERCIAL • INSTITUTIONAL • PUBLIC BUILDINGS

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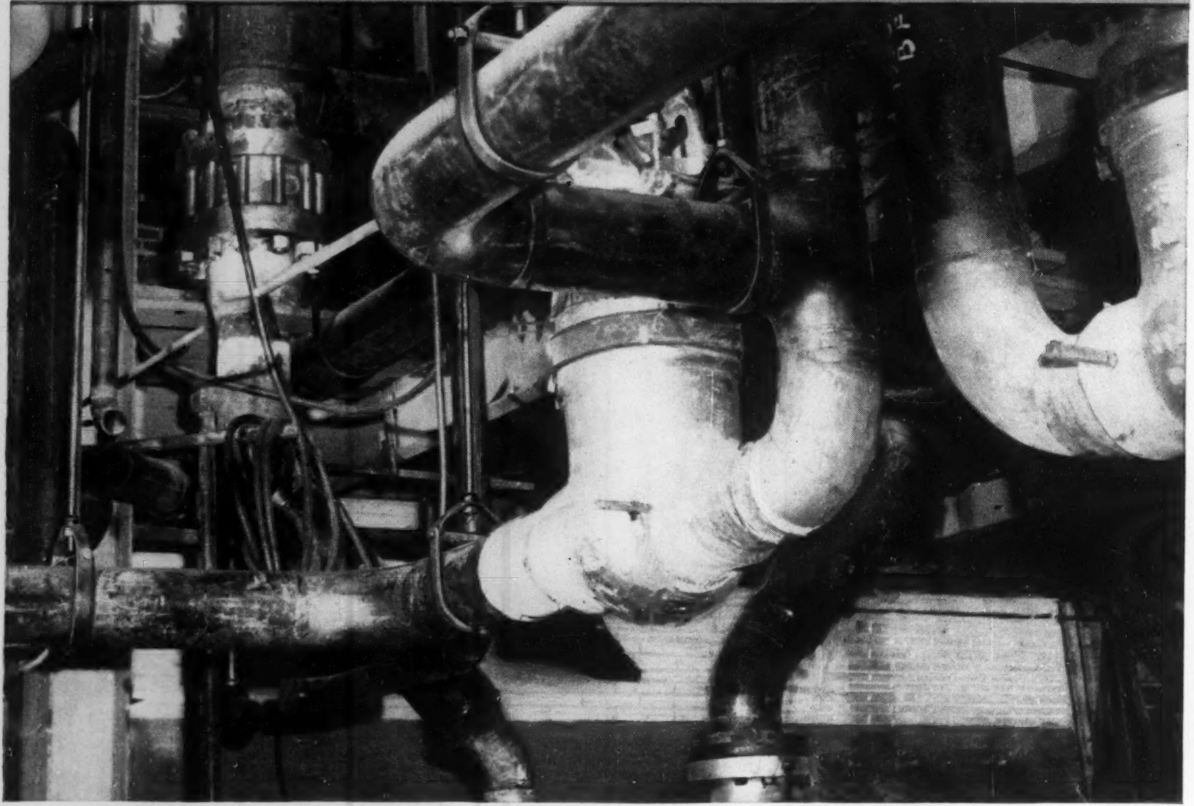
STRONGER THAN PIPE



Boiler feed discharge piping shown under construction above will operate at 2700 psi and 430° F.

Grinnell Welding Fittings

exceed bursting strength of seamless pipe

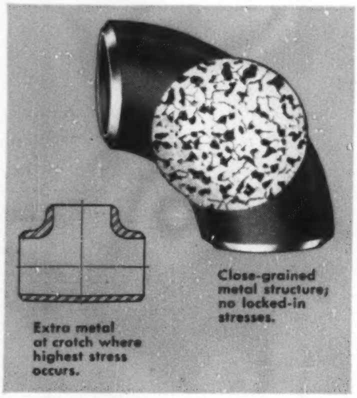
Grinnell Welding Fittings are designed and processed to have a bursting strength greater than the calculated bursting strength of the seamless pipe to which they are to be welded.

Welding elbows and bends are made from seamless steel pipe by a forging process which produces uniform wall thickness at all points; there is no thinning of outer wall.

Welding tees and crosses are made from seamless pipe by a drawing process which provides extra metal and protection at the crotch, where highest stress occurs.

All Grinnell Welding Fittings are process stress-relieved, thus improving grain structure and increasing the strength of the metal.

With all Grinnell Welding Fittings, you get true circularity; smooth, clean inside surface; full, effective radius; easy, sweeping turns; accurate bevels; and true included angles. Available in a wide range of types and sizes, metals and alloys. Send for descriptive catalog.


Close-grained metal structure; no locked-in stresses.
Extra metal at crotch where highest stress occurs.

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WHENEVER PIPING IS INVOLVED

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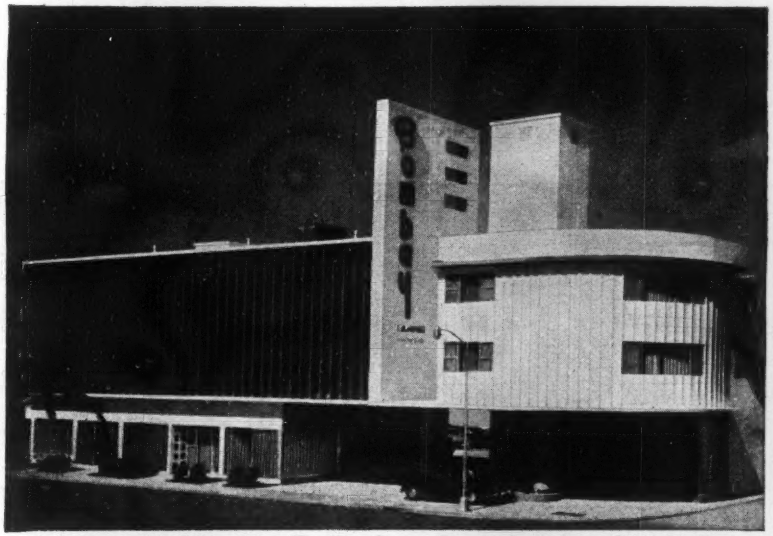
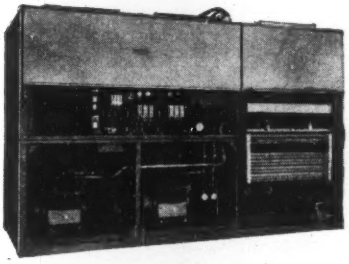


Arch: Norman M. Giller, *Contr:* Hamilton Constr. Co., *Air Cond. Contr.:* Airko Air Cond.

Beautiful 100 Room Miami Hotel Air Conditioned by 3 Central Station Packaged Units

Bombay Hotel system arranged for either of two conditioners to handle second or third floor rooms with other unit shut down

Architect Norman Giller had an eye to maximum economy of operation when he specified 3 USAIRCO DRK (Dual Circuit Refrigerated Kooler-aire) units for the Bombay Hotel in Miami Beach, Florida.



One 30 H.P. DRK cools the Bombay's lobby, card room, cocktail lounge and coffee shop. A 40 H.P. DRK and another 30 H.P. DRK cool the 100 guest rooms in this show place structure of Miami Beach. Each DRK unit consists of air conditioner, compressor and evaporative condenser sections all combined in this one integrated assembly.

Installation was made so that either of the two room-cooling DRKs can handle second or third floor rooms with the other unit shut down. This arrangement is particularly advantageous when the number of guests is reduced and only one floor of rooms is occupied.

Seasonal load variations present no problem because the DRK is wired with a two-stage thermostat, which automatically operates one or both compressors. Circuit design provides maximum dehumidification at either full or partial load.

DRK units are custom fabricated at the factory and are available in 7 sizes, from 10 to 50 H.P.

●

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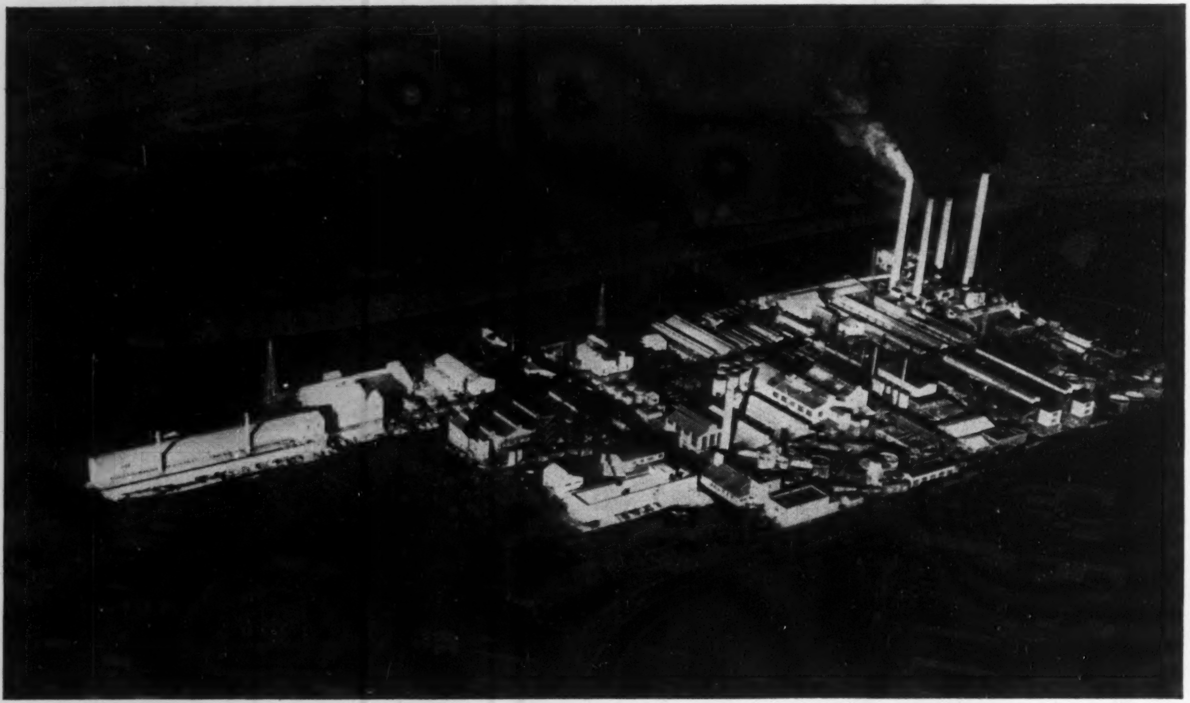
Oh, I see



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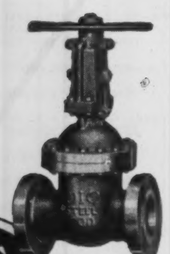

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Heating Piping & Air Conditioning

Vol. 26 No. 3

(with which is merged the Aerologist)

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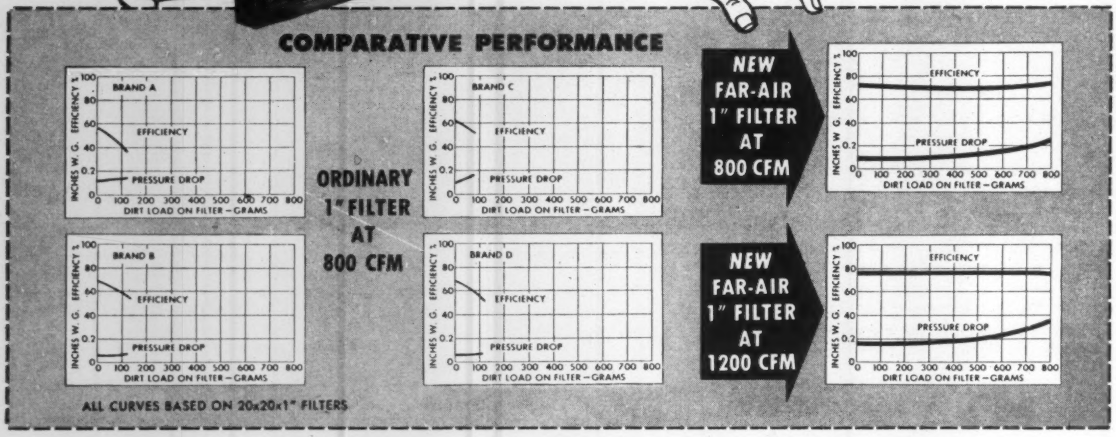

These graphs show actual performance of the new FAR-AIR High-Low Velocity 1" Filter as compared to performance of ordinary types under identical conditions. In addition, it delivers half-again as much clean air because of 50% greater capacity.

Permanent, scientifically designed and ruggedly built, it eliminates the necessity for never-ending replacements. No longer need you put up with poor performance as ordinary 1" filters approach the useless point.

Because it loads progressively, it gives you high efficiency air filtration without critical pressure loss right up to cleaning time. Cleaning is simple and easy. With reasonable care it will last indefinitely.

Here at last is the new-type filter all industry has been waiting for. It means higher quality performance from ⅓ less space, with literally negligible service requirements.

Eliminate the wasteful expense of inefficient filters —save time and trouble—get better air filtration at lower cost. Write today for complete information. Farr Company, P. O. Box 10187, Airport Station, Los Angeles 45, California.

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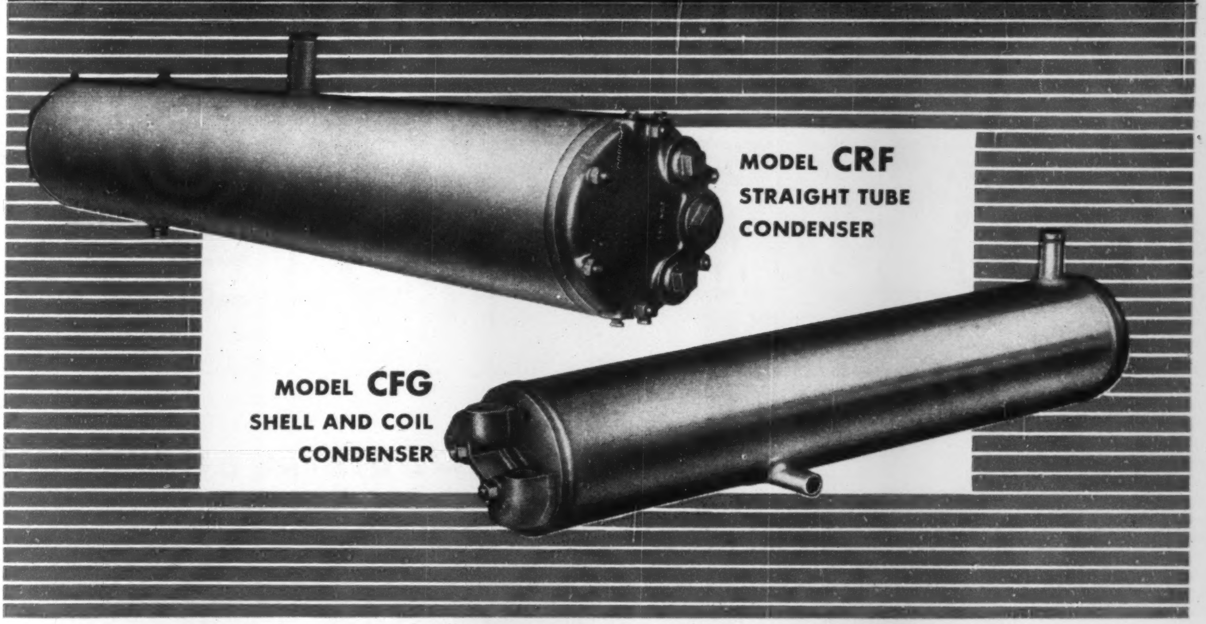

FOR REPLACEMENT WORK OR ORIGINAL EQUIPMENT IN SMALLER TONNAGE INSTALLATIONS

B & G quality in two moderately priced refrigeration condensers! Both are built in popular sizes which enable wholesalers to maintain representative stocks—ready for immediate shipment. Both are excellent units for replacement work or as original equipment for installations within their capacity range.

Model CRF is an extended surface, straight tube unit, with removable head for easy cleaning. It is constructed, tested and stamped in accordance with ASME Unfired Pressure Vessel Code.

Model CFG is a shell and coil condenser, with extended surface for rapid transfer of heat. Correct designing and sturdy construction assure efficient, dependable service. These units are built to ASME Code requirements and labeled "UM."

For complete data, send for bulletin FU-1153.

SELECTION DATA, MODEL CRF

125 lb. working pressure tube side (water); 300 lb. shell side (refrigerant)

Model Number	RATING—TONS REFRIGERATION ① Tons	Water Pressure Drop—PSI	② Tons	Water Pressure Drop—PSI	No. of Tubes	No. of Passes	Condensing Surface Square Feet	③ Pump Down Capacity Freon 12 lbs.
CRF-2	2.2	.5	2.1	.5	12	4-8	17.1	30.8
CRF-3	3.7	1	3.5	.75	24	4-8	31.7	53.2
CRF-5	5.75	2.5	5.4	1.1	24	4-8	43.5	71.8
CRF-7.5	8.5	6	8	2.9	24	4-8	55	90
CRF-10	12.8	6	12	2.9	36	4-8	83	146
CRF-15	17	6	16	2.9	48	4-8	110	131
CRF-20	22	8	21	4	58	4-8	141	126.5
CRF-25	29	11	28	5.25	64	4-8	179	146

NOTE ① Based on water in at 75° F, out at 95° F (1.5 GPM/ton), 102° F condensing temperature and 40° F suction temperature—maximum number of head passes.
NOTE ② Based on water in at 85° F, out at 95° F (3 GPM/ton), 105° F condensing temperature and 40° F suction temperature—minimum number of head passes.
NOTE ③ Pump down capacity based on 80% of total volume and Freon 12 at 102° F.

SELECTION DATA, MODEL CFG

150 lb. working pressure tube side (water); 300 lb. shell side (refrigerant)

Model Number	RATING—TONS REFRIGERATION ① Tons	Water Pressure Drop—Lbs.	② Tons	Water Pressure Drop—Lbs.	③ Pump Down Capacity Freon 12 lbs.
CFG-2	2.1	2.5	2.4	7	19
CFG-3	3.15	2	3.3	5	30
CFG-5	5.2	2	5.4	5.2	35
CFG-7.5	7.85	2.5	8.1	7	60
CFG-10	10.5	2	11	6	78

NOTE ① Based on water in at 75° F, out at 95° F (1.5 GPM/ton), 102° F condensing temperature and 40° F suction temperature.
NOTE ② Based on water in at 85° F, out at 95° F (3 GPM/ton), 105° F condensing temperature and 40° F suction temperature.
NOTE ③ Pump down capacity based on 80% of total volume and Freon 12 at 102° F.

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OPEN—DRIP-PROOF

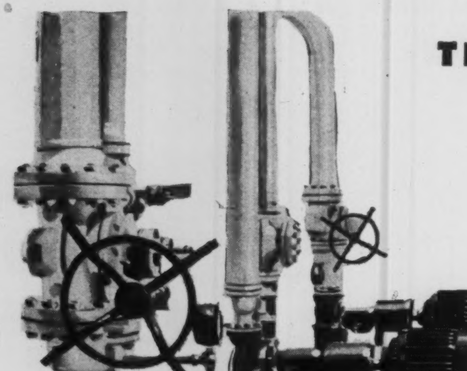
Here are a few of the reasons why the new Allis-Chalmers open—drip-proof motor in NEMA rerate sizes will give you better performance and lower maintenance costs in general-purpose applications.

- Better protection against falling water and debris because cooling air inlets are on bottom.
- Long bearing life because large grease chambers provide plenty of reserve lubricant and are thoroughly sealed against foreign matter.
- Quieter operation, smoother performance.

TEFC and EXPLOSION-PROOF

For especially dirty, corrosive or hazardous applications, you will get top performance with low maintenance costs from the new Allis-Chalmers totally-enclosed, fan-cooled and explosion-proof motors in NEMA rerate sizes. Here are a few of the reasons:

- Foreign matter kept out of bearings and motor interior by double labyrinth seals inside and outside of bearings, and long running fits between shaft and seals.
- Bearing maintenance reduced because large grease chambers provide space for reserve lubricant; also, if required, grease may be renewed without dismantling.
- Easy to clean — no inaccessible air passages. Dirt wipes or blows off easily.



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A-4280

CHALMERS

How Honeywell Customized Temperature Control helps provide

The kind of "Indoor Weather" your clients need

Customized Temperature Control installation at Corning Glass Center is a good example.

AT THE Corning Glass Center in Corning, New York, you'll find a museum, offices, shops—and production areas where Steuben glassware is made.

Such a variety of functions under one roof calls for scientific temperature control—if the "indoor weather" is to be comfortable throughout the building.

Today the best way to provide proper "indoor weather"—whether a building houses one function or many—is through the use of *Honeywell Customized Temperature Control.*

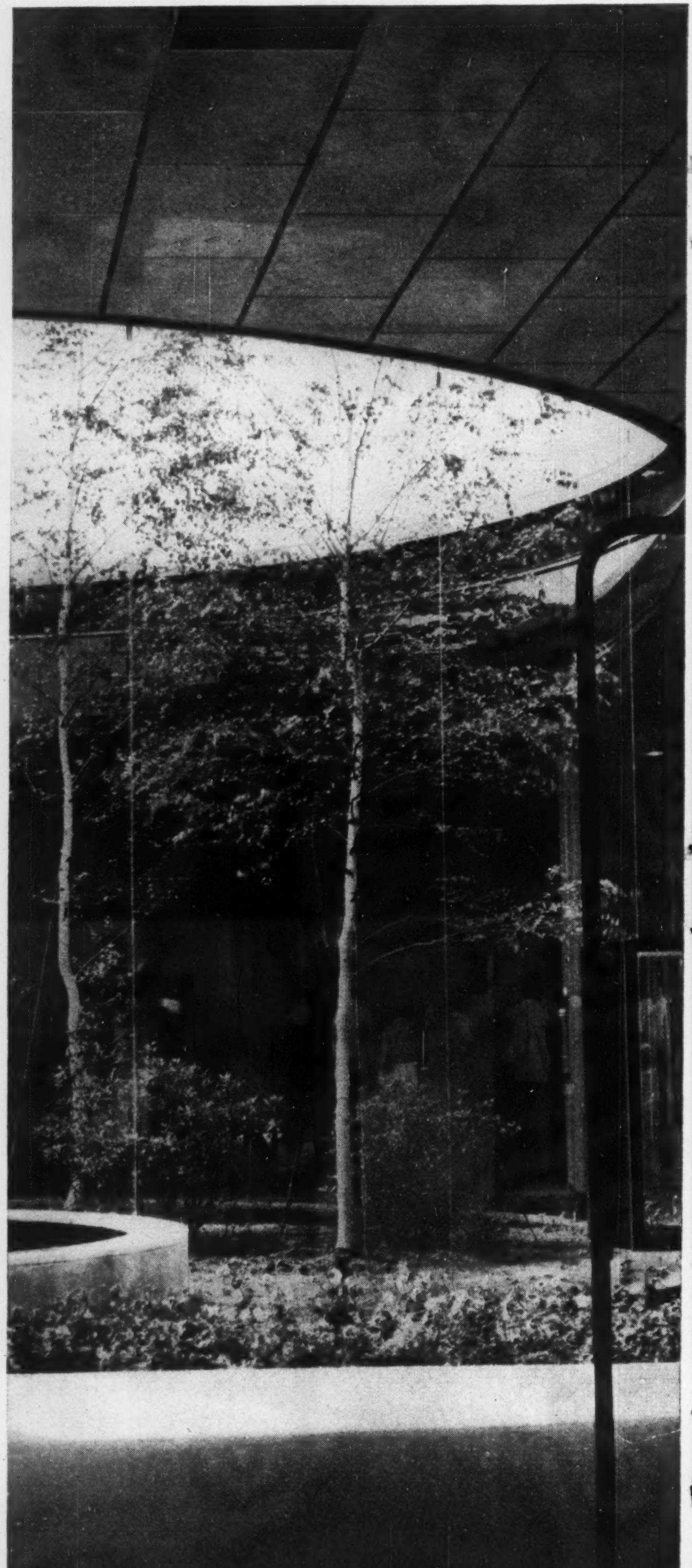
The key word here is "customized". It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants is your answer.* This applies not only to heating and cooling, ventilating and humidity control—but to industrial control as well.

Only Honeywell can provide true "customized" control. Because only Honeywell manufacturers all three types of controls—pneumatic, electric and electronic.

The story, in brief form, of the Honeywell Customized Temperature Control installation in the Corning Glass Center is told by the floor plan and picture captions you see here.

They tell how specific occupancy, use and exposure problems were met.

The *techniques* used, applied to your particular problems, can help you give your clients the "indoor weather" they've always wanted.



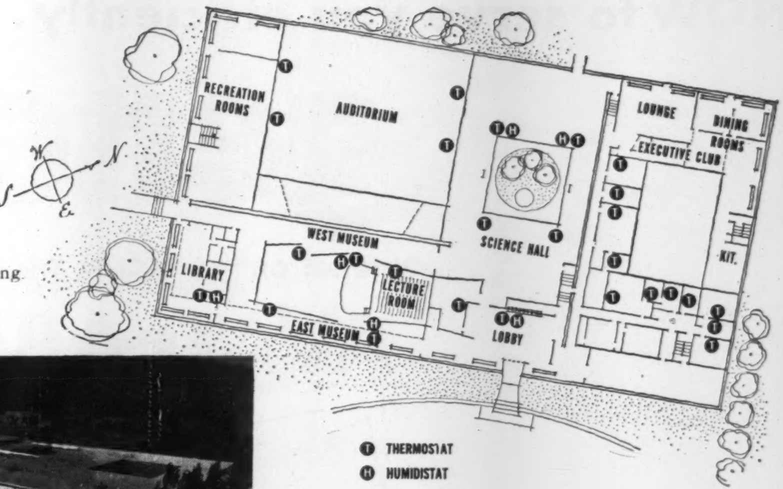
Interior garden of Corning Glass Center

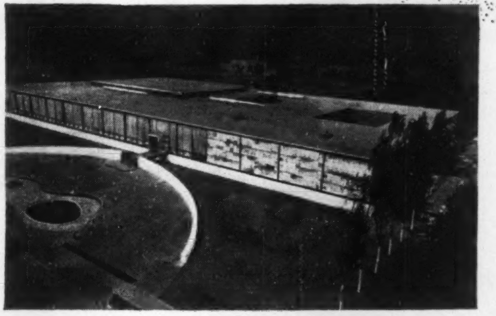
GLASS FOR LIVING

Architects: Harrison, Abramovitz and Abbe, New York, N. Y.

Mechanical and Electrical Consulting Engineers: Jaros, Baum and Bolles, New York, N. Y.

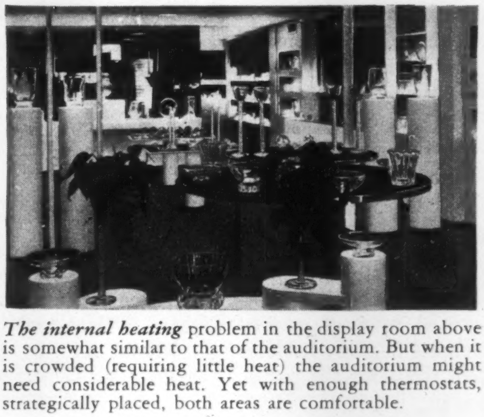
Air Conditioning Consulting Engineers: Henry Peck Associates, Fairport, N. Y.





This panorama of the Corning Glass Center shows the temperature control problems involved. Huge glass window areas face four directions. Whether it is sunny or cloudy makes a big difference to the heating and cooling system. But Honeywell Customized Temperature Control, using electronic and pneumatic thermostat and humidistats, keeps the building comfortable all the time.

Interior heating and cooling factors are important, too. Take the auditorium above, for instance. With a large crowd you have one heating problem. With a small group, quite another. But the four Honeywell thermostats located here handle either situation easily.



The internal heating problem in the display room above is somewhat similar to that of the auditorium. But when it is crowded (requiring little heat) the auditorium might need considerable heat. Yet with enough thermostats, strategically placed, both areas are comfortable.

For comfortable, even temperature in new or existing buildings—of any size—specify Honeywell Customized Temperature Control

Whether it's a factory, motel, hospital — any building of any size — new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems. You can give your clients more comfort and efficiency. And they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

James M. Brown, III, director of the Corning Glass Center, says:

"Today our Glass Center is one of the most comfortable buildings in the country. Important in helping make possible this comfort is our Honeywell Customized Temperature Control installation."

MINNEAPOLIS
Honeywell

First in Controls

104 OFFICES ACROSS THE NATION

Minneapolis-Honeywell Regulator Co.
Dept. HA-3-60, Minneapolis 8, Minnesota

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I'm interested in learning more about Honeywell Customized Temperature Control.

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Firm Name..

Address..

City.................. *Zone*.......... *State*..................

NOW to serve you efficiently...economically

genetron®

"genetron" 11 (CCl_3F) Trichloromonofluoromethane and

AVAILABLE FROM

SEATTLE
SAN FRANCISCO
LOS ANGELES
DENVER
genetron 12

Do You Know These Facts About "Genetron" Refrigerants?

Q. Are the "Genetrons" proven?

A. Yes. "Genetron" 12 is the widely used refrigerant, dichlorodifluoromethane, which has long been the mainstay of the refrigeration and air conditioning industry. "Genetron" 11 is trichloromonofluoromethane, second of the big "work horse" fluorine refrigerants.

Q. Are "Genetrons" approved?

A. Certainly. "Genetron" refrigerants have been tested exhaustively by major manufacturers and are being used in their refrigeration and air conditioning equipment. "Genetrons" meet the very highest standards of performance. They are identical in application with dichlorodifluoromethane and trichloromonofluoromethane from any source.

Q. What about their moisture content?

A. It's extremely low! General Chemical's special methods for producing "Genetron" refrigerants are so exacting that their quality is consistently better than indicated by these stringent manufacturing specifications:

	"Genetron" 12	"Genetron" 11
Moisture-wt. % max.	0.0010	0.0025

Q. Is their overall purity good?

A. Yes, it's of the highest! The "Genetrons" are extremely pure chemicals manufactured to meet quality standards which are in many respects more rigid than those for the purest research chemicals.

Q. What container sizes are available?

A. "Genetron" refrigerants are offered in the various standard container sizes required by manufacturers and wholesalers. "Genetron" 12 is shipped in 2,000-lb., 145-lb., 25-lb., and 10-lb. cylinders; "Genetron" 11 in 2,200-lb. cylinders and 200- and 100-lb. drums.

REFRIGERANTS

"genetron" 12 (CCl_2F_2) Dichlorodifluoromethane

COAST TO COAST

MINNEAPOLIS
MILWAUKEE
KALAMAZOO
DETROIT
CHICAGO
CLEVELAND
BUFFALO
PITTSBURGH
ALBANY
BOSTON
PROVIDENCE
BRIDGEPORT
NEW YORK
PHILADELPHIA
BALTIMORE
ST. LOUIS
CHARLOTTE
ATLANTA
GREENVILLE
BIRMINGHAM
BATON ROUGE
HOUSTON
JACKSONVILLE

Strategic Stocks and Convenient Sales Offices

TO SERVE YOU BEST!

East—West—North and South, there's a General Chemical distributing station or sales office to give you swift service on "Genetron" refrigerants—whether you are a manufacturer or a wholesaler—whether you require carload or small cylinder shipments.

These locations in the heart of refrigeration and air conditioning centers assure a *reliable* and *constant* source of supply, since each distribution point augments the stock of the other. Together they form a coast-to-coast "pipeline" that can supply your refrigerant needs equally well—if you operate in one location or several.

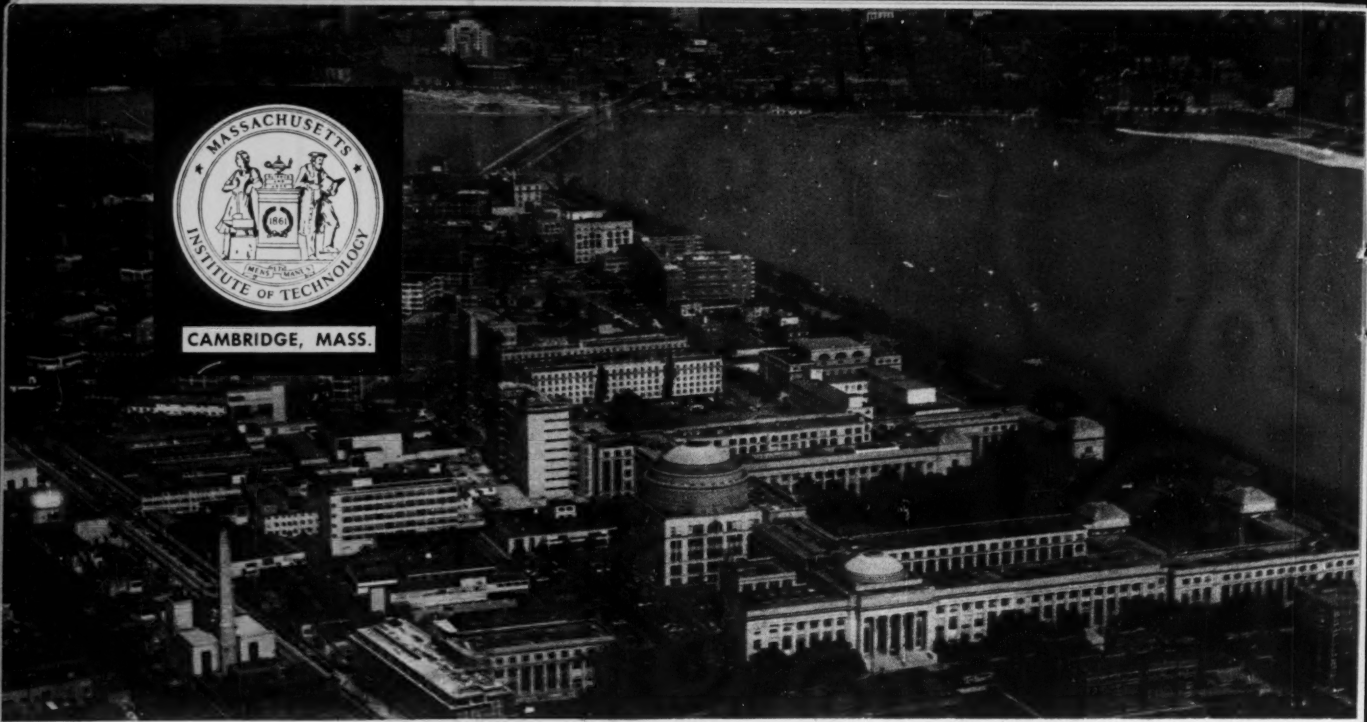
Why not check into the "Genetron" situation today!

Allied Chemical

FOR FURTHER INFORMATION about "Genetron" refrigerants, write or phone the nearest General Chemical office listed below. Ask for free Technical Service Bulletin 11 • 12A, "Genetron" Refrigerants.

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

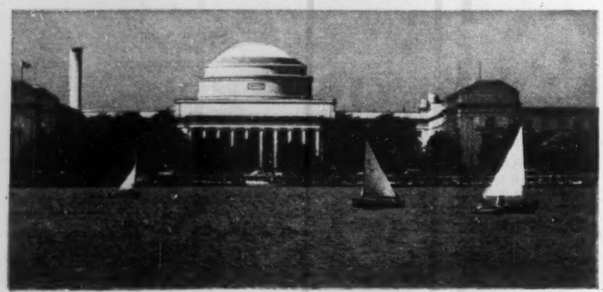
Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo • Charlotte • Chicago • Cleveland
Denver • Detroit • Greenville (Miss.) • Houston • Jacksonville • Kalamazoo • Los Angeles • Minneapolis • New York
Philadelphia • Pittsburgh • Providence • San Francisco • Seattle • St. Louis • Yakima (Wash.)
In Wisconsin: General Chemical Company, Inc., Milwaukee
In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver



Another **M. I. T.** *Building Equipped*

In this Famous Scientific Institute Powers thermostatic control for heating and air conditioning systems is used in the new Dorrance Laboratory for Biology and Food Technology and in the buildings listed below.

- **MAIN EDUCATIONAL AND ADMINISTRATION BUILDINGS**
- **GAS TURBINE LABORATORY**
- **CHEMICAL ENGINEERING BUILDING**
  Architects: Coolidge and Carlson • Contractor: The Downey Co.
- **HAYDEN MEMORIAL LIBRARY**
  Architects and Engineers: Vorhees, Walker, Foley and Smith
  Contractor: Cleghorn Co.
- **NUCLEAR SCIENCE LABORATORY**
  Architects: Anderson & Beckwith • Contractor: The Merrill Co., Inc.
- **SWIMMING POOL BUILDING**
  Architects: Anderson & Beckwith
  Engineers: Wolff & Munier • Contractor: H. E. Whitten Co.
- **NEW AUDITORIUM, now under construction**
  Architects: Eero Saarinen & Associates
  Associate Architects: Anderson & Beckwith
  Engineer: Hyde & Bobbio • Contractor: H. E. Whitten Co.



Other Prominent Users of

UNITED STATES CAPITOL
House and Senate Chambers
UNITED NATIONS
General Assembly
and Conference Buildings
HARVARD UNIVERSITY
Various Prominent Buildings

POWERS CONTROL
TEMPERATURE AND HUMIDITY

Argonne National Laboratory • Abbott Laboratories
Aluminum Co. of America • American Telephone & Tel. Co.
American Optical Co. • Anheuser Busch Co. • Armour & Co.
Bendix Aviation Corp. • Bachman-Uxbridge Worsted Co.
Campbell Soup Company • Celanese Corp. of America
Chrysler Corp. • Ford Motor Co. • General Motors Corp.
Douglas Aircraft Co. • E. I. DuPont de Nemours Co.
Esso Research Center • Eastman Kodak Co.
B. F. Goodrich Tire & Rubber Co. • Humble Oil Co.
Johns Manville Co. • Johnson & Johnson Co.
Lever Brothers Co. • Eli Lilly & Co. • Lily Tulip Cup Corp.
Lahey Clinic • Massachusetts General Hospital
Massachusetts Mutual Life Insurance Co.
Monsanto Chemical Co. • Montgomery Ward & Co.
Parke Davis & Co. • Pepperell Mfg. Co. • Sears Roebuck & Co.
Sharp & Dohme Inc. • Swift & Co. • Thompson Products, Inc.
Wm. Wrigley Co. • Hiram Walker Inc. • Wyman-Gordon Co.
New York Stock Exchange • Radio City Music Hall
Madison Square and Boston Garden • Rockefeller Center

JOHN THOMPSON DORRANCE LABORATORY

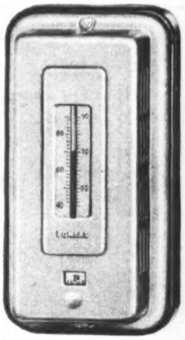
FOR
BIOLOGY and FOOD
TECHNOLOGY

Architects
ANDERSON & BECKWITH

Engineers
CLEVERDON, VARNEY & PIKE

Contractor
JAS. S. CASSEDY, INC.

with a **POWERS** Pneumatic System of *Temperature Control*



Powers Room Type Thermostat pneumatically regulates heating and air conditioning systems. Outstanding for accuracy and dependability.

Laboratory with an Exciting Future — From this modern laboratory with its excellent staff and research facilities will come great advances that will surpass the progress of the past and produce discoveries which will benefit us all.

Correct room temperature and humidity is important here. Research labs, animal rooms, constant temperature rooms and classrooms require the even, constant temperature assured by a Powers control system.

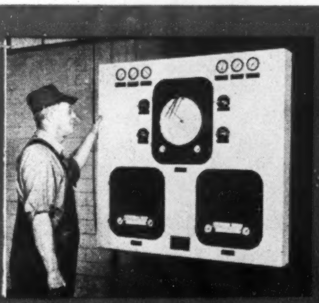
When you want dependable, accurate control for heating, cooling or air conditioning for any building or industrial process call Powers. With over 60 years of experience and efficient modern equipment we can help you select the best control for your requirements.

THE POWERS REGULATOR CO.

OVER 60 YEARS OF AUTOMATIC TEMPERATURE CONTROL

SKOKIE, ILLINOIS • Offices in Over 50 Cities in U. S. A., CANADA and MEXICO

(b46)



POWERS
PACKLESS
VALVES

. . . eliminate packing maintenance, leakage of water or steam, or loss of vacuum.

A full summer of Air

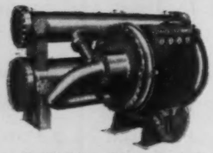
Trane UniTrane System in "world's biggest house"

Typical installation shows unit free-standing under window. In Woodner apartments, unlike this one, units are recessed, extending only 7″ into room. Models are also available for concealed wall, ceiling or closet installation.

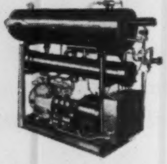
In all cases, they provide true year-'round comfort. A simple small-pipe circuit supplies chilled water to each UniTrane coil for summer cooling and dehumidifying—hot water for winter heating.

All air, not just ventilation air, is filtered in unit before passing over coil—an important TRANE feature eliminating clogged coils and maintenance expense.

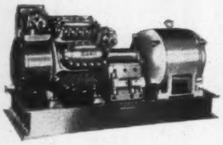
SPECIFY MATCHED TRANE EQUIPMENT FOR UNDIVIDED RESPONSIBILITY!



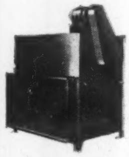
CenTraVac—New centrifugal water chilling system . . . sets new standards of operating efficiency. 45 to 400 tons



Cold Generator—Packaged water chiller. Completely wired, piped, refrigerant-charged at factory. 10 to 100 tons.



Reciprocating Compressors—Rugged, dependable, quiet, efficient. Automatic multi-step cylinder unloading. 6 sizes up to 50 tons.



Climate Changers—Heat, cool, humidify, dehumidify, filter. Provide up to 6 zones with different combinations. 450 to 23,400 cfm.

For information on the complete TRANE line, call your nearest TRANE office or write TRANE, La Crosse, Wis.

TRANE UniTrane

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada Ltd., Toronto • 87 U. S. and 14 Canadian Offices.

Engineers: General Engineering Associates, Washington D. C.

Conditioning for $7 33 operating cost per tenant!

cuts cost—gives tenants individual climate control

In the new $12-million Woodner Apartments, Washington, D. C., 3,000 tenants in 1,140 apartments were cooled during the entire sweltering summer of 1953 by TRANE UniTrane room air conditioners . . . at an estimated cost of only $22,000 for electricity and cooling tower make-up water.

Slashes power requirements: With the UniTrane system, cooling (or heating) is used only where it's needed. Individual room units can be shut off in unoccupied rooms without affecting operation of any of the other units. Because ventilation air is brought directly through the outside wall into each room unit, there is no central ventilation system to operate.

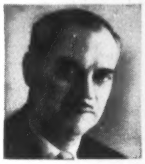
Result: Operating load can be matched directly to fluctuating temperature requirements for lowest possible operating cost.

Tenants like UniTrane because it places climate control completely in their hands. Occupants of any size motel, hotel, office or apartment building can have the temperature they want, in *any* room, *any time*, day or night.

Owners like UniTrane because this unique combination of tenant advantages costs less to install, far less to operate. No central ventilation system to maintain—no complicated ventilation controls are required. All air, both ventilation and recirculated, is filtered at the unit. Rooms and decorations stay clean longer.

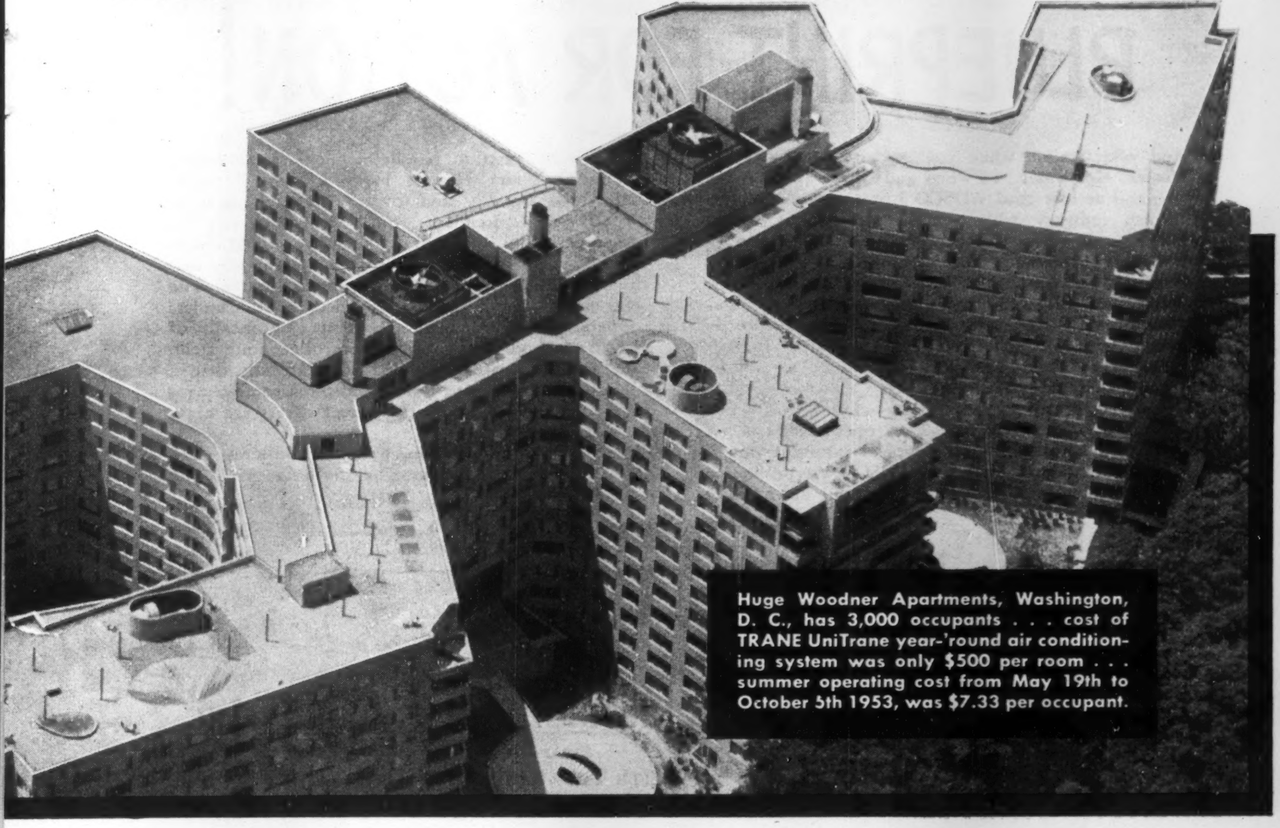
Architects welcome the savings in valuable floor space, design freedom. Units are available in all sizes and types—free-standing, recessed, semi-recessed, ceiling—for either exposed or concealed installation.

Engineers appreciate being able to plan full capacity for each space. They like the heavy-gauge construction, the quieter operation (each unit is sound-room tested before shipment.)

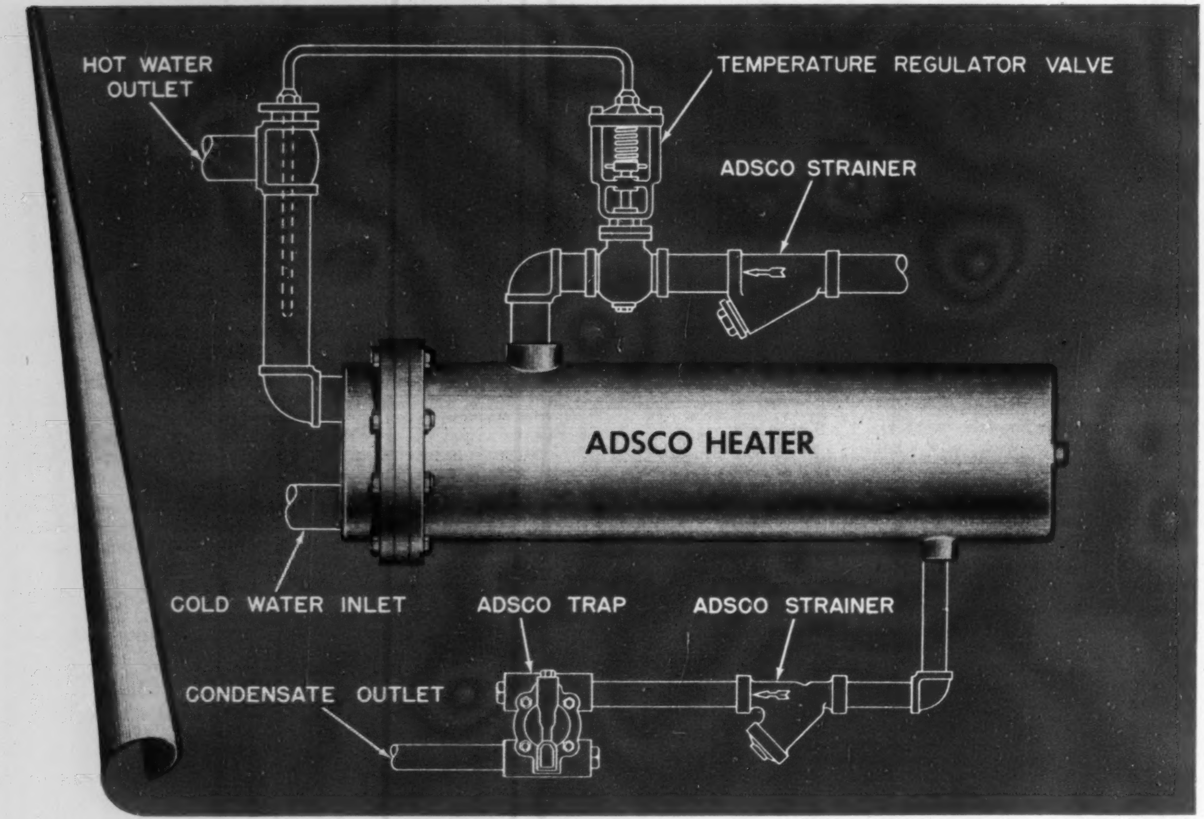


"Our 3,000 residents are delighted with the system which works well even at the worst of Washington's sweltering summer," says owner-architect Ian Woodner. "We compliment you on the quality of your installation and the soundness of its design and workmanship."

Award for outstanding new building of 1952 was presented to Ian Woodner by Washington Board of Trade. The building was judged by a distinguished panel of nationally-known architects.



Huge Woodner Apartments, Washington, D. C., has 3,000 occupants . . . cost of TRANE UniTrane year-'round air conditioning system was only $500 per room . . . summer operating cost from May 19th to October 5th 1953, was $7.33 per occupant.



BLUEPRINT FOR ACTION!

And what action, when you use an ADSCO Water Heater! Hot water . . . when and where you want it . . . and at low cost! ADSCO Instantaneous Heaters furnish industry with general service hot water, boiler feed water, and process water. They supply hotels, apartments, office buildings, dormitories, hospitals, and institutions with hot water for showers, washrooms, dishwashers, laundries, and for general cleaning. ADSCO Convertors, a type of instantaneous heater with a shorter temperature range, furnish *all types* of buildings with hot water for quiet, trouble-free space heating systems.

Yes, you get plenty of action — fast action — out of ADSCO Water Heaters. They operate best when connected according to the typical piping arrangement shown above, with two ADSCO Y-type Strainers to protect valuable equipment and an ADSCO Dual Steam Trap to handle condensate efficiently.

ADSCO Water Heaters have only three parts: shell, tube bundle, and cover. All are made to ADSCO's high standards. Steel shells are seamless steel pipe, carefully cut and welded by skilled workmen. The shell flange is sturdy and accurately machined and all openings are precisely located. The tube bundles are made of pure, deoxidized seamless copper tubes formed into U-bends. By means of electrically and automatically controlled equipment, they are rolled and expanded into carefully drilled tube sheets which have a diamond pitch arrangement for spacing of tubes. The semi-steel covers are high-tensile, fine-grain castings.

For further information, write for Bulletin 35-78 on Instantaneous Heaters or Bulletin 35-77 on Convertors.

ADSCO
ENGINEERED PRODUCTS

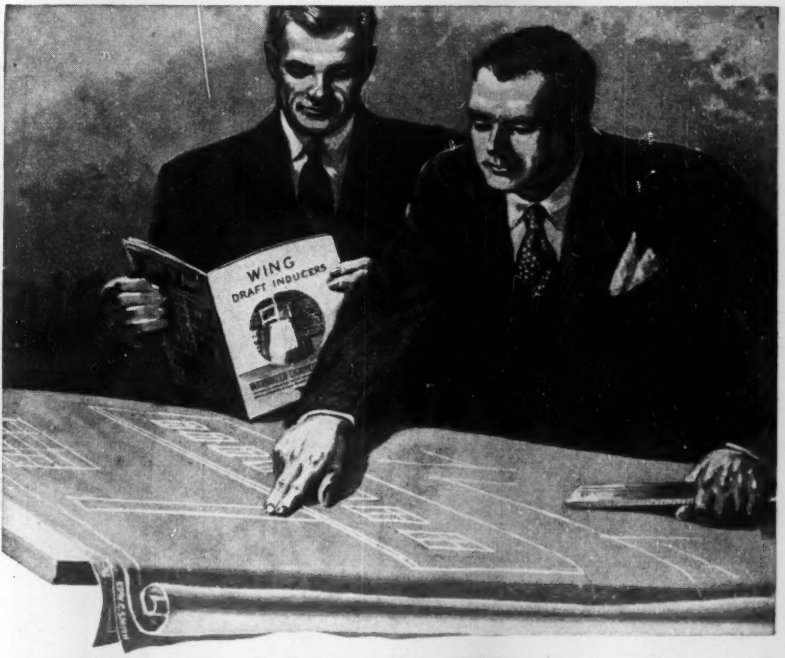
EXPANSION JOINTS SEPARATORS METERS STEAM TRAPS STORAGE HEATERS STRAINERS

AMERICAN DISTRICT STEAM COMPANY, INC.
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y., AND RICHMOND, CALIF.

HEAT THAT MOVES AROUND

with the WING REVOLVING HEATER

The fact that the discharge outlets of Wing Revolving Heaters keep the heated air in gentle, constant motion is the reason firms like the Budd Company have installed Wing Revolving Heaters in their plants, both at Philadelphia, and at the plant shown in the photograph above at Gary, Indiana. Big blanking and forming presses make a natural barrier to ordinary heating systems, but not to the moving streams of heated air from the Wing Revolving Heaters, even suspended, as they must be, far above the floor to clear the cranes. Uniform distribution is accomplished because the moving streams of heated air sweep slowly around through 360 degrees, covering successively every direction; thus every part of the plant is kept at a comfortable temperature. And in Summer, with the steam turned off and fans on, the revolving discharge outlets create a sensation of pleasing coolness that is very refreshing even on the hottest days. Write for a copy of Bulletin HR-6 to L. J. Wing Mfg. Co., 140 Vreeland Mills Road, Linden, New Jersey.



"...Let's cut this stack off here and put a Wing Draft Inducer on the boiler...We'll save the cost of the chimney, have better draft and a better looking building."

If you are building or rebuilding or increasing the size of your boiler plant, a costly, tall chimney can add considerably to the expense. And a well planned architectural design can be ruined with an unsightly, towering stack.

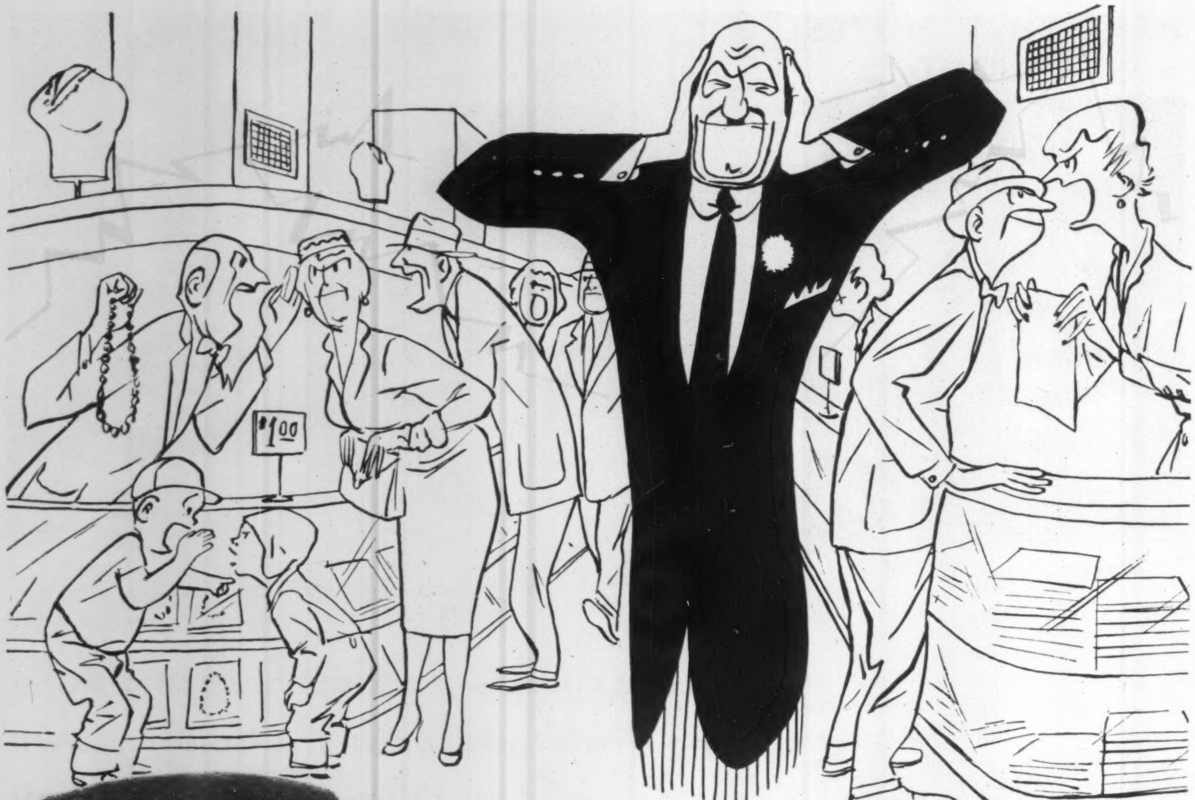
WING DRAFT INDUCERS eliminate this problem, providing positive, adequate, uniform draft regardless of surrounding conditions, or variable weather. They cut operating costs too, by giving higher CO_2's. Smoking is reduced or eliminated. Higher boiler capacity is possible.

Write for Bulletin I-52

Wing

L. J. Wing Mfg. Co.
140 Vreeland Mills Road
Linden, New Jersey
Factories: Linden, N. J. and Montreal, Can.

UNIT HEATERS
FANS
BLOWERS
DRAFT INDUCERS
TURBINES



Just for the want of a little

ULTRALITE Duct Liner . . .

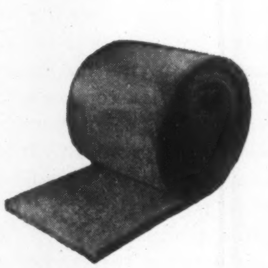
. . . customers lost their patience, the store manager nearly lost his mind—and the people who installed the air conditioning system nearly lost the good will of the store.

Here's what happened: The store's "specs" did not call for duct liner. The sheet metal contractor called this oversight to the store's attention and recommended Ultralite glass fiber Duct Liner. But the store felt that the additional cost, while small, was not necessary.

Came the Grand Opening of the modernized store—with the results pictured above. Of course, the contractor received an urgent call-back. He quickly solved the noise problem with Ultralite Duct Liner. A happy ending—except that it cost the store several times as much as if they had originally lined the ducts with Ultralite!

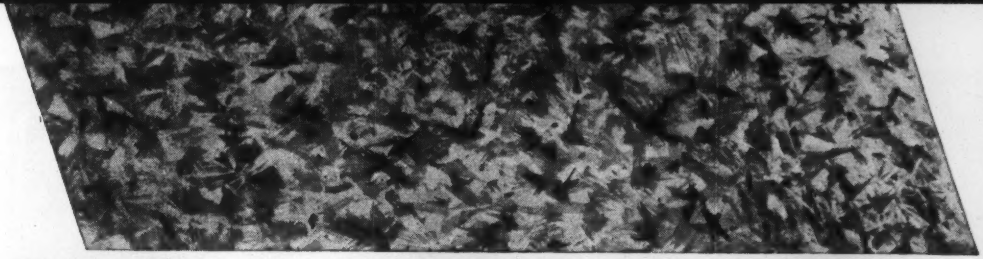
Moral: Urge every customer not to be pennywise and pound foolish about duct liner. See that Ultralite Duct Liner is in all your air conditoning specs. From a cost standpoint, Ultralite is just a small portion of the total cost—but it can make all the difference between an enthusiastic customer and a disgruntled one. That's why many contractors put Ultralite Duct Liner in every job—*even those where duct liner is not specified.*

Ultralite is the only insulation made of long-strong glass fibers. Easy to install, pleasant to handle. Ultralite Duct Insulation (for thermal protection) and Ultralite Duct Liner are stocked locally in 72 cities. Your nearby distributor is listed in the Yellow Pages under "Gustin-Bacon" or "Ultralite."



gb

GUSTIN-BACON MANUFACTURING CO.
220 W. 10th St., Kansas City, Missouri
New York • Chicago • Philadelphia • San Francisco • Los Angeles • Houston • Tulsa
Dallas • Detroit • St. Louis



U·S·S Galvanized Steel Sheets

—for tight and neat bends, joints, angles

U S S
TRADE MARK
STEEL
UNITED STATES STEEL

WHENEVER you have a job—small or large, residential or industrial—that presents a particularly difficult fabricating problem, you'll find that it pays to use the material that gives the best results, that meets the requirements of exacting clients, that fabricates with the greatest ease.

U·S·S Galvanized Steel Sheets are made from high-quality carbon steel, with a uniformly heavy coating of zinc that won't flake or crack, assuring lasting protection from rust and corrosion. Because all U·S·S Steel Sheets are uniform in flatness, ductility and workability, they can be bent, cut, stamped or welded quickly and easily.

Your customers know and appreciate the quality that stands behind the U·S·S Label appearing on U·S·S Galvanized Steel Sheets. It will pay you—in satisfied customers and repeat orders—to cash in on the wide acceptance of this well-known product.

U·S·S Galvanized Steel Sheets are available in quantity now. You can be sure that you can get all you need to handle any size job. Ask your sheet distributor or our nearest district office. United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

UNITED STATES STEEL CORPORATION, PITTSBURGH · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S GALVANIZED STEEL SHEETS

UNITED STATES STEEL

T F

10" STD T F TAYLOR FORGE WPB
10" STD T F TAYLOR FORGE WPB

Caps are part of the story

The announcement of the WeldELL line, back in 1931, created a considerable sensation in the piping field. Pipe welding was then just beginning to emerge from the crude, cut-fit-patch stage and the only welding fittings then in use were simply elbows.

But here was a *full line* of welding fittings—not only the long and short radius ells, but also full branch and reducing tees, concentric and eccentric reducers, stub ends, welding neck flanges . . . even *caps!*

You know what happened: The WeldELL line had taken pipe welding out of darkness into light . . . had provided the impetus and set the pattern of modern pipe welding practice.

Yes, the WeldELL line was the first complete line—the first engineered line . . . and the fittings that showed the way are still showing the way. For up-to-the-minute facts about the WeldELL line see your Taylor Forge Distributor.

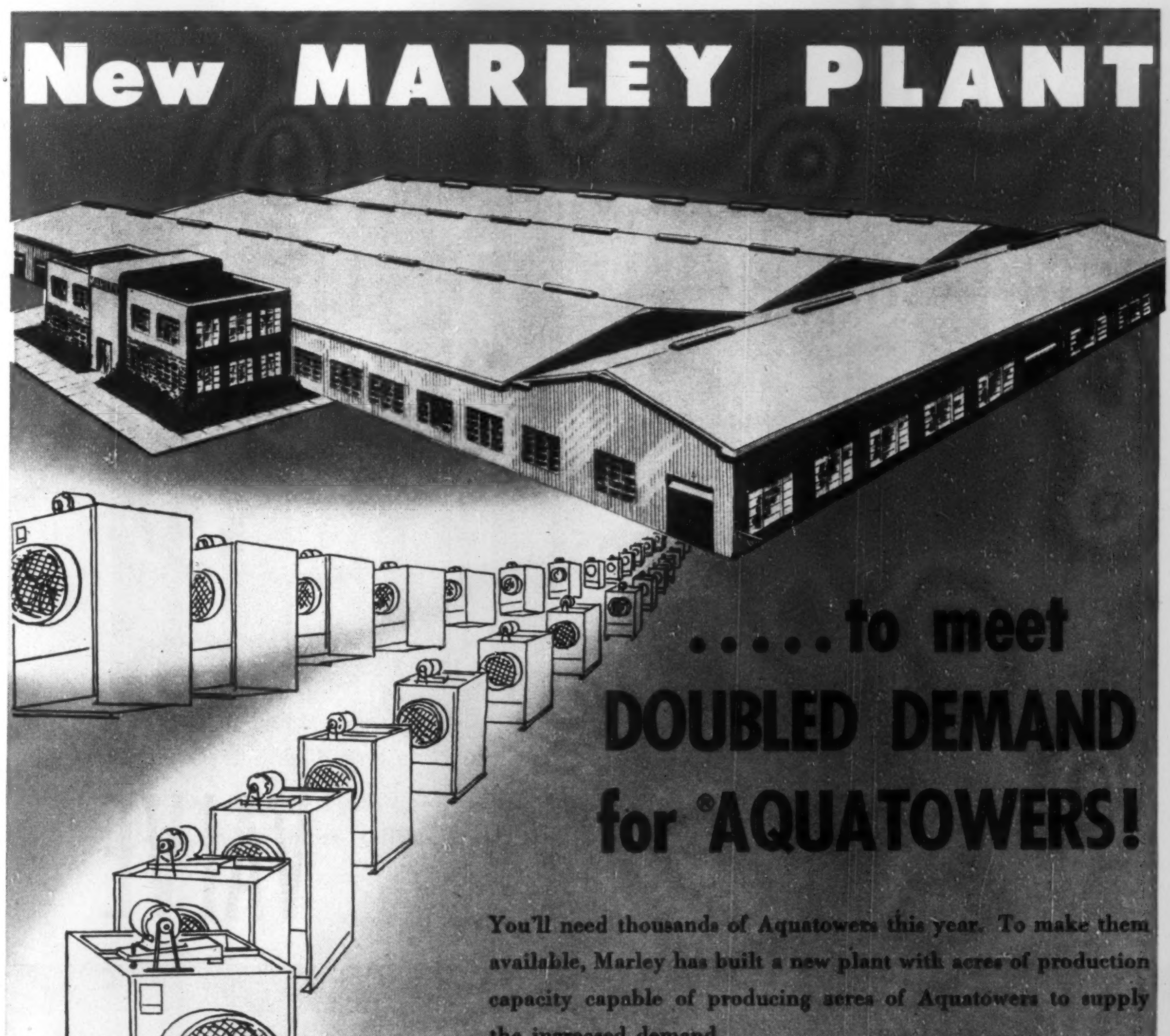
10" STD T F TAYLOR FORGE WPB

TAYLOR FORGE

TAYLOR FORGE & PIPE WORKS

General Offices and Works: P. O. Box 485, Chicago 90, Illinois

Offices in all principal cities • Plants at: Carnegie, Pa.; Fontana, Calif.; Gary, Ind.; Hamilton, Ont., Can.



New MARLEY PLANT

.....to meet DOUBLED DEMAND for ®AQUATOWERS!

You'll need thousands of Aquatowers this year. To make them available, Marley has built a new plant with acres of production capacity capable of producing acres of Aquatowers to supply the increased demand.

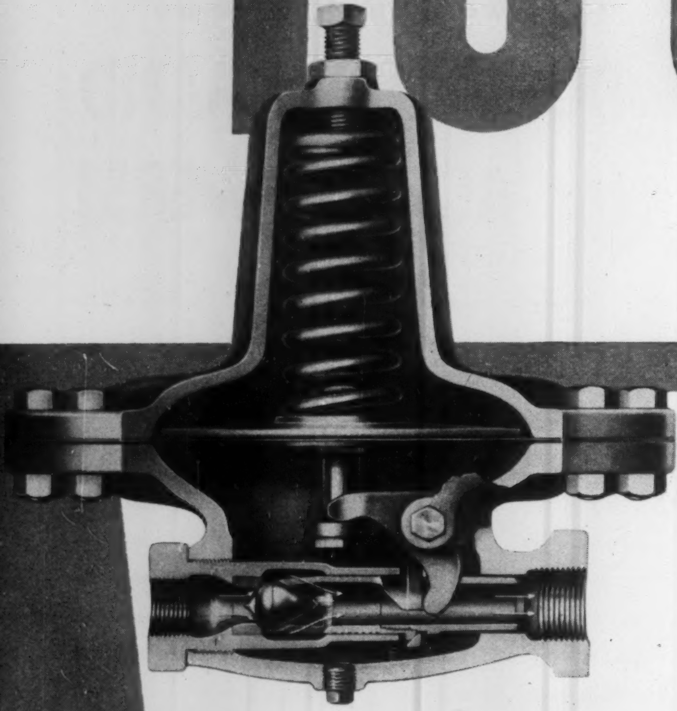
Marley is truly geared to satisfy the DOUBLED (or tripled) DEMAND for Aquatowers in 1954. This huge new plant, with plenty of productive capacity, with new machine tools and new production methods, added to Marley's years of experience and engineering know-how assures this. It means that anyone who wants Aquatowers (and most people do) can get them where and when they need them.

There will be no waiting this year. No one will have to accept a substitute for an Aquatower. They will be available in a complete range of sizes from warehouses all over the country. For full information, consult your Marley representative in most major cities or write directly to us.

MARLEY

The Marley Company
Kansas City, Missouri

*TYPE 1000 VALVE



Any product of quality should be dependable when *ordinary* products fail. Sudden pressure fluctuations, dirt, scale and viscous matter prove "fatal" to ordinary pressure reducing valves.

The CASH STANDARD TYPE 1000 VALVE however, is designed to operate with complete dependability under the most difficult and unusual circumstances. Many of these units have been in service over 10 years and have never been taken "out of the line."

Truly an *EXTRAORDINARY* achievement of quality and design excellence.

INSTALL CASH STANDARD "TYPE 1000" VALVES

CASH STANDARD **DECATUR, ILLINOIS**

A. W. CASH COMPANY

1854 · 1954
our 100TH year
OF SUCCESSFUL MANUFACTURING EXPERIENCE

YOU'LL SELL MORE PROFITABLE JOBS

with the complete line of

Curtis

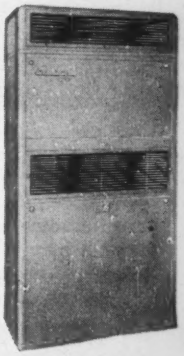
AIR CONDITIONING AND REFRIGERATION EQUIPMENT

NEW 1954 Curtis Room Air Conditioner—an attractive, efficient unit with a BIG market potential

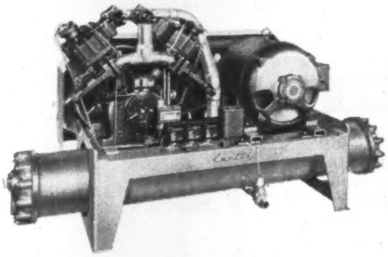
Every product in the Curtis line is built with quality material and workmanship.

Curtis equipment is known around the world for its dependability and efficiency.

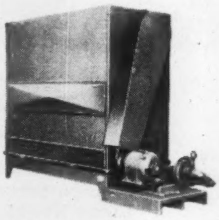
With the complete Curtis line, you can handle any installation for **Home, Office, Store,** or **Factory.**



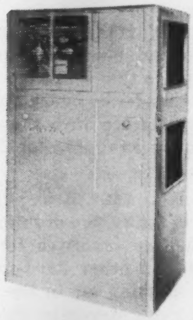
Packaged Units—
2, 3, 5, 7½ and 10 tons
Choice of open or semi-hermetic compressors . . .
and 15 ton packaged
Central type units



Condensing units—through 80 tons



Evaporative Condensers, Cooling Towers and Air Handling units to match



Residential cooling and heating units

You may qualify for a direct factory franchise. Write us, using your company letterhead.

POST
TIME
Newsweek
house home

National advertising in *Saturday Evening Post, Time, Newsweek* and *House and Home,* plus many other publications helps sell Curtis to your customers and prospects. Attractive new sales literature is available to help you sell in your local area.

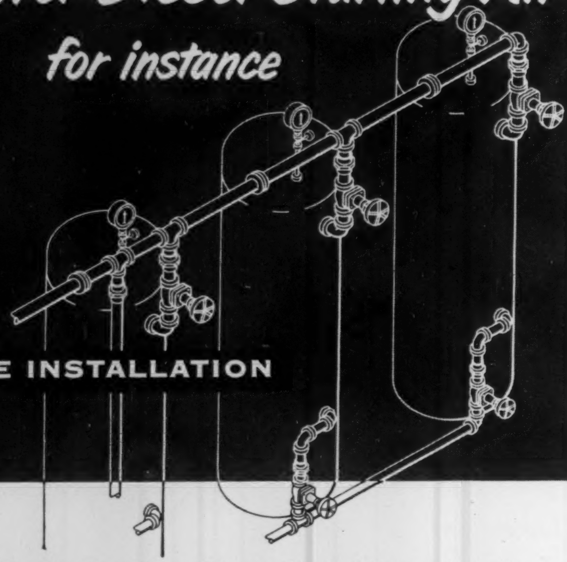
765

CURTIS REFRIGERATING MACHINE DIVISION
OF CURTIS MANUFACTURING CO.
1950 KIENLEN AVENUE
ST. LOUIS 20, MISSOURI

If It's a Hard-to-Hold Fluid, Here's Your Valve

...for Diesel Starting Air

for instance



By Higgins, Inc., New Orleans ship building and repair yard, famous for PT boats . . . now using Crane heavy-duty all-iron valves for 250 psi diesel starting air systems on passenger and truck ferries, fishing boats, etc.

VALVE SERVICE RATINGS

SUITABILITY:
100% Effective

FEATURES:
Lead faced disc

MAINTENANCE COST:
Rarely needs care

SERVICE LIFE:
Indefinite

OPERATING RESULT:
No loss of diesel starting air

AVAILABILITY:
Crane catalog item — No. 1504

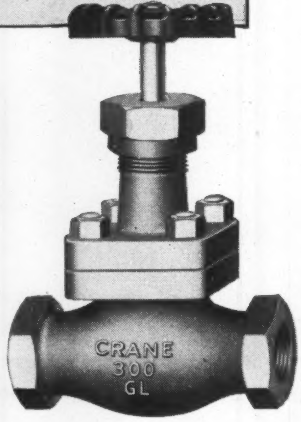
THE CASE HISTORY

By Higgins engineers' standards, marine diesel power is only as dependable as its starting equipment. Specifications are that a full charge be maintained in the starting air tanks overnight and longer. This, they found impossible with the conventional seating valves normally available for 250 psi working pressure.

But with Crane No. 1504 heavy-duty all-iron valves installed at the tanks, the problem was solved perfectly. These all-time favorites for dependable control of ammonia and other hard-to-hold fluids, are holding 250 psi starting air in the tanks indefinitely . . . and with valve dependability assured by Crane quality.

THE VALVE

Proved completely dependable in high-pressure ammonia, Crane No. 1504 all-iron globe valves are widely preferred for many air, oil, and gas services requiring the tightest seating, leak-proof body-bonnet joint, and extra-durable stem seal. Regularly supplied with lead face disc, or with steel seating for higher temperature and corrosive fluids. Sizes 1/4 to 4 in.; flanged or screwed ends; also angle patterns. Ask your Crane Representative for Folder AD1977.



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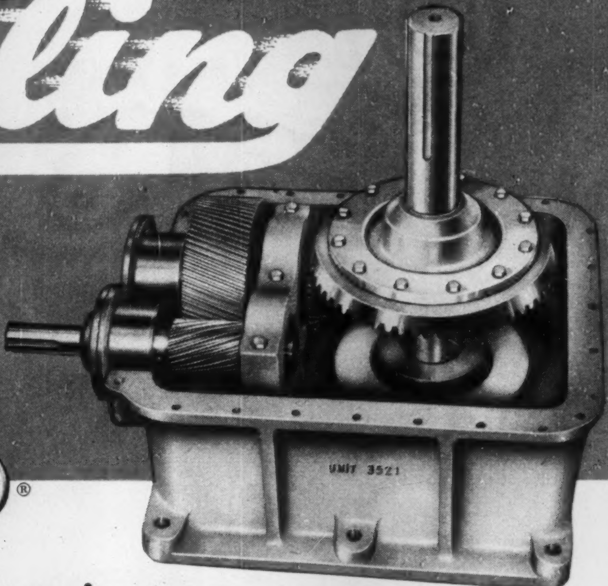
3 Cooling

TOWER DRIVES

by PHILLIE GEAR®



a type and size for every requirement

The growing use of larger fans in cooling tower service brought the need for a drive that would best meet heavier load conditions. Philadelphia, having long been a leading manufacturer of conventional worm gear cooling tower drives, thoroughly understood this problem and presents a complete line of right angle Speed Reducers . . . Worm Gear, Spiral Bevel, and Helical Spiral Bevel. All three types are specifically manufactured for cooling tower fan drives. Housings are made of high quality close-grained grey iron and are proportioned to withstand the severe stresses encountered during operation. All shafts mounted in anti-friction bearings to assure high efficiency, correct center distance and proper shaft alignment. Bearings provide generous thrust and radial capacity . . . all these features give long, quiet service life.

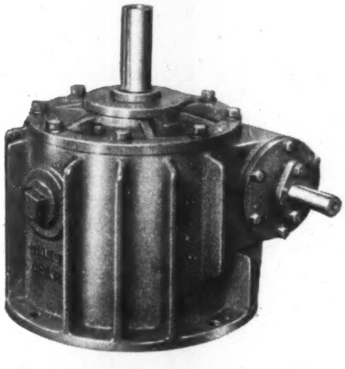
worm gear

HP range—3 thru 30 HP @ 1750 rpm input.

Ratio range—3⅝ to 8¾.

Efficiency—up to 95% depending on ratio.

Application—Best economy in range up to 25 HP. Quiet operation, suitable for input speeds up to 2000 rpm.



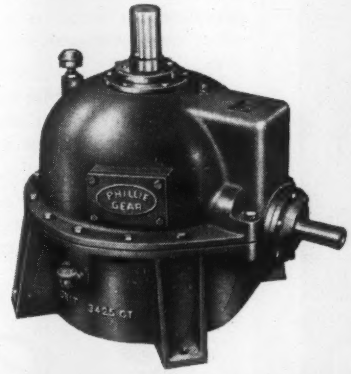
spiral bevel

HP range—15 thru 75 HP @ 1750 rpm input.

Ratio range—3½ to 9⅕:1.

Efficiency—97-98%.

Application—Best economy above 15 HP. Advantages of high efficiency, small heat loss. Suitable for input speeds up to 2500 rpm.



helical spiral bevel

HP range—20 thru 115 HP @ 1750 rpm input.

Ratio range—6⅔ to 15:1.

Efficiency—95-96%.

Application—Best economy when used on drives greater than 25 HP and when required ratios exceed those possible with single reduction spiral bevel. This unit also best suited for turbine applications up to 4000 rpm input.

Write for our new catalog CT-53 illustrating all types of Cooling Tower gear drives and their applications.

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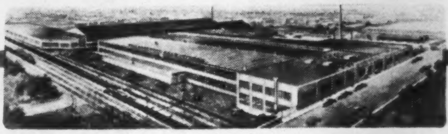

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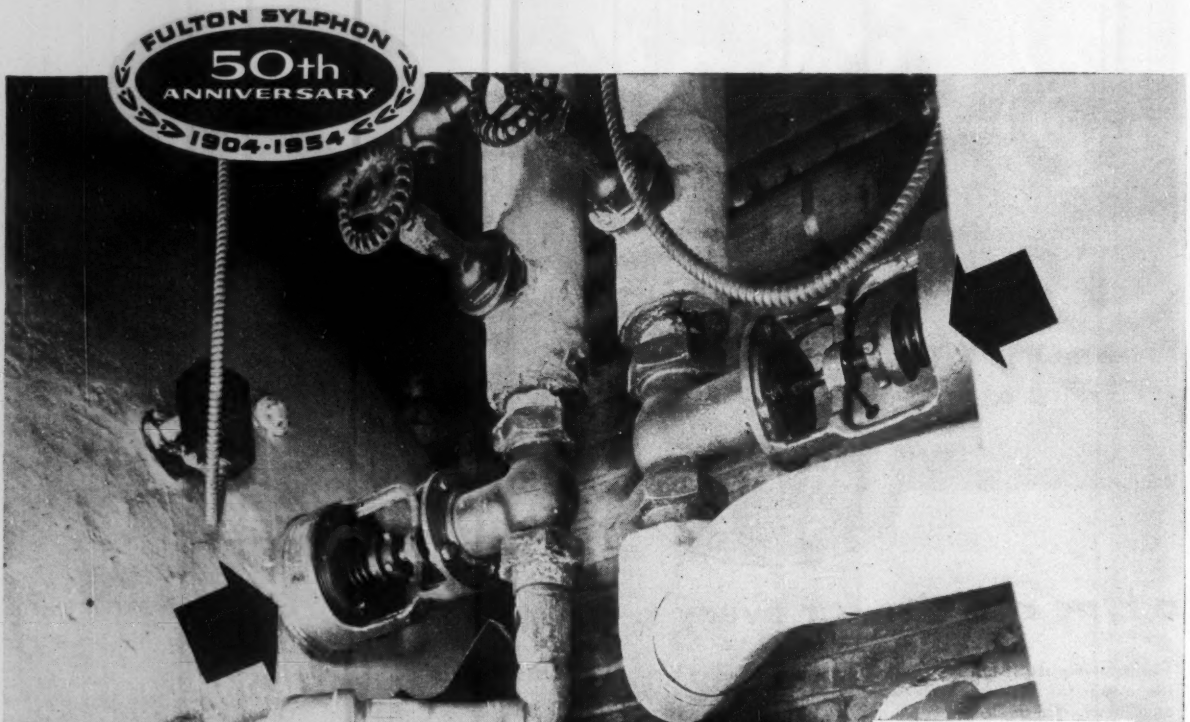

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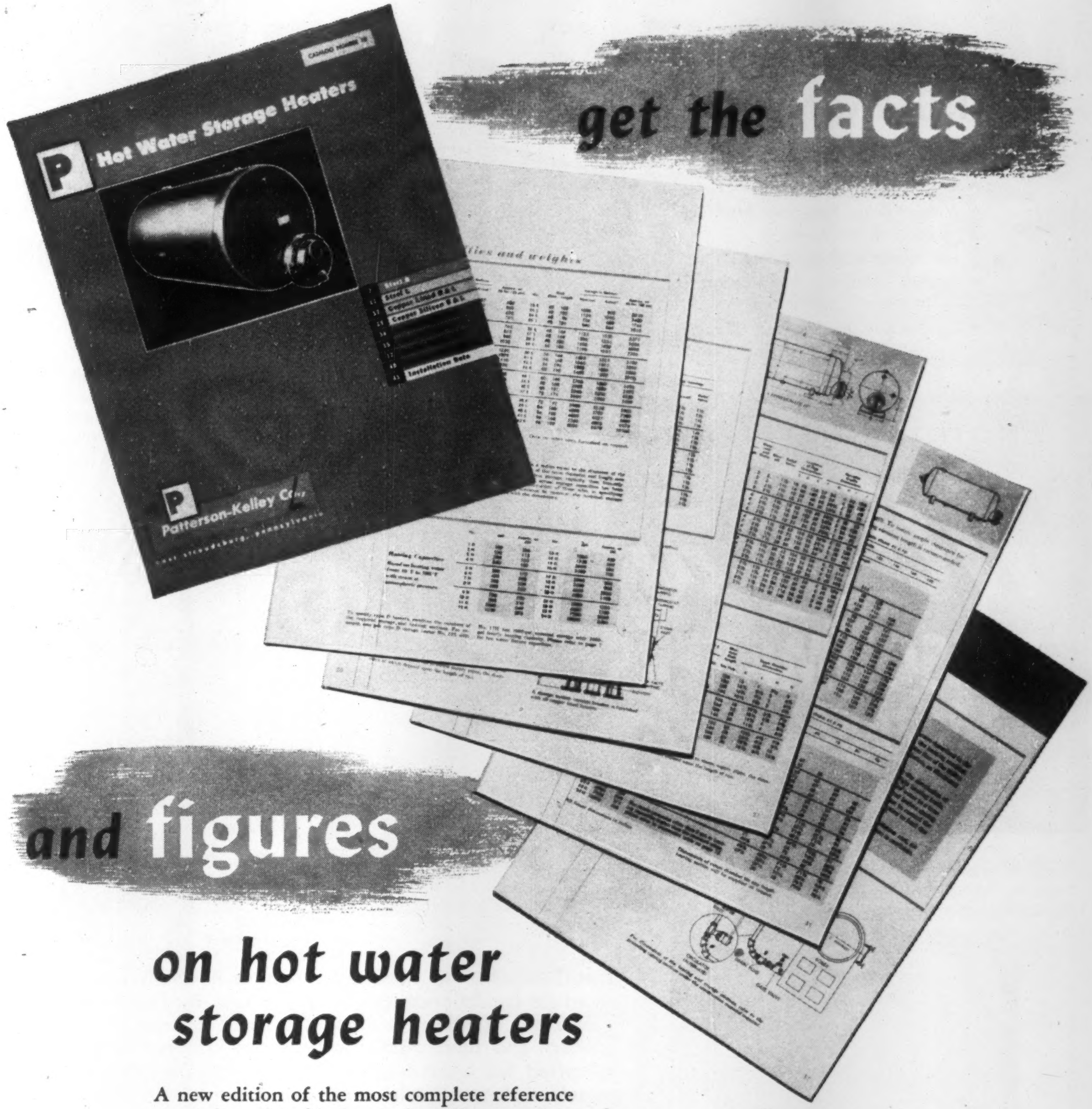

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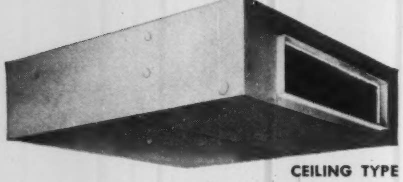
For free standing mounting beneath a window or along a wall.



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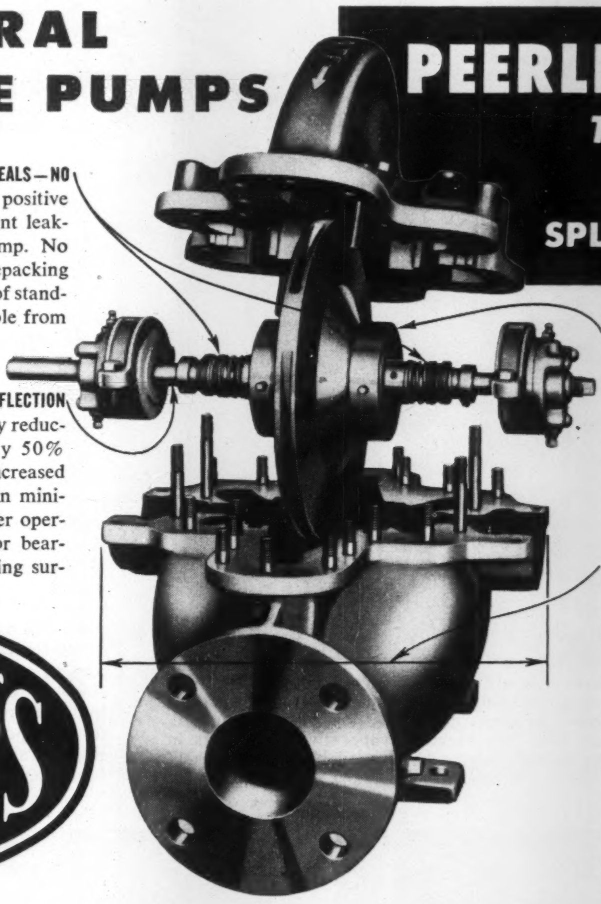
A NEW DESIGN

IN GENERAL PURPOSE PUMPS

PEERLESS Type AS HORIZONTAL SPLIT CASE PUMP



USES MECHANICAL SHAFT SEALS—NO STUFFING BOXES. Single positive acting, shaft seals prevent leakage of liquid from pump. No more down-time for repacking stuffing boxes. Seals are of standard design easily available from commercial sources.

SHORT SHAFT AND LESS DEFLECTION MEANS LONGER PUMP LIFE. By reducing shaft length nearly 50% Peerless has effectively increased shaft rigidity, resulting in minimum deflection, smoother operation and longer life for bearings, seals and all wearing surfaces.

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OCCUPIES HALF THE SPACE OF CONVENTIONAL DESIGNS. Floor space saving is made possible by elimination of packing gland housings. Provides more room for accessibility to piping, valves and control equipment.

CUSTOM PUMP—STANDARD PRICE. Type AS pumps cost no more than ordinary split-case pumps. Yet you get extra quality, without paying a premium. Proved in service.

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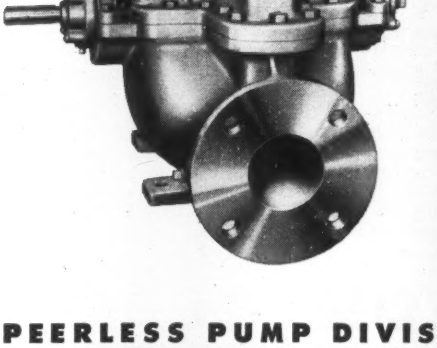
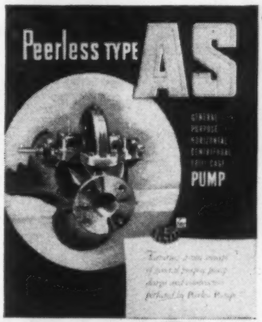


A *NEW* PUMP DESIGNED AROUND MECHANICAL SHAFT SEALS



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that completely describes its advantages

Write for Bulletin No. B-1350 which completely describes and illustrates the modern design and construction features of Peerless Type AS pumps.

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PEERLESS PUMPS

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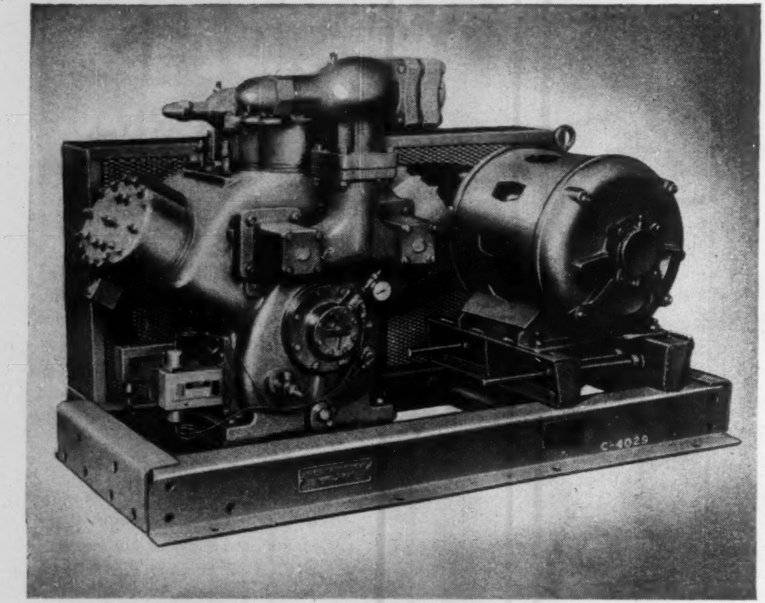
The whole industry's talking about Worthington's new Freon compressor



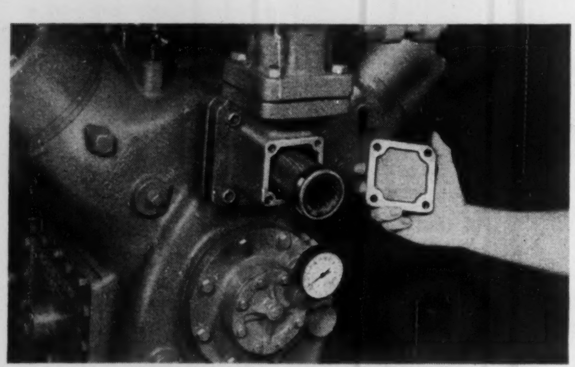
TRIM, STURDY CONSTRUCTION marks this 4JF6 compressor unit — 50-60 hp, six cylinder W-type compressor. The complete compact unit consists of fabricated steel base, compressor with valves, gauges and safety controls, drive and safety guard. Designed to operate in conjunction with Worthington evaporative condensers in localities where city water is scarce or high in cost. Also available with shell and tube condenser. Complete range from 3-150 hp.

"The high capacity unit we've been waiting for!"

"Greater operating efficiency!"

"There's nothing else like it!"

And every comment you hear is true! The refrigeration compressor is the most vital element of any air conditioning or refrigeration system. That's why Worthington spent years in developing the new "J" Freon compressor. That's why Worthington invested over a million dollars in compressor research. *And that's why you can't find its match in any other unit.* Only a few features of the new "J" Freon compressor are highlighted here — get the full story by contacting your nearest Worthington district office or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.4.33, Harrison, New Jersey.



EASY REMOVAL of suction gas strainer for cleaning is made possible by new suction manifold design. No pipes, valves or other parts need to be dismantled in order to get at the strainer. And Worthington's new electric unloaders automatically balance power consumption with load requirements.

LORD & TAYLOR'S new West Hartford, Conn., store depends on Worthington to provide comfortable air conditioning for its customers. Two 150 hp "J" compressors and two evaporative condensers make up the highly efficient Worthington air conditioning team at this modern store.

A.4.33

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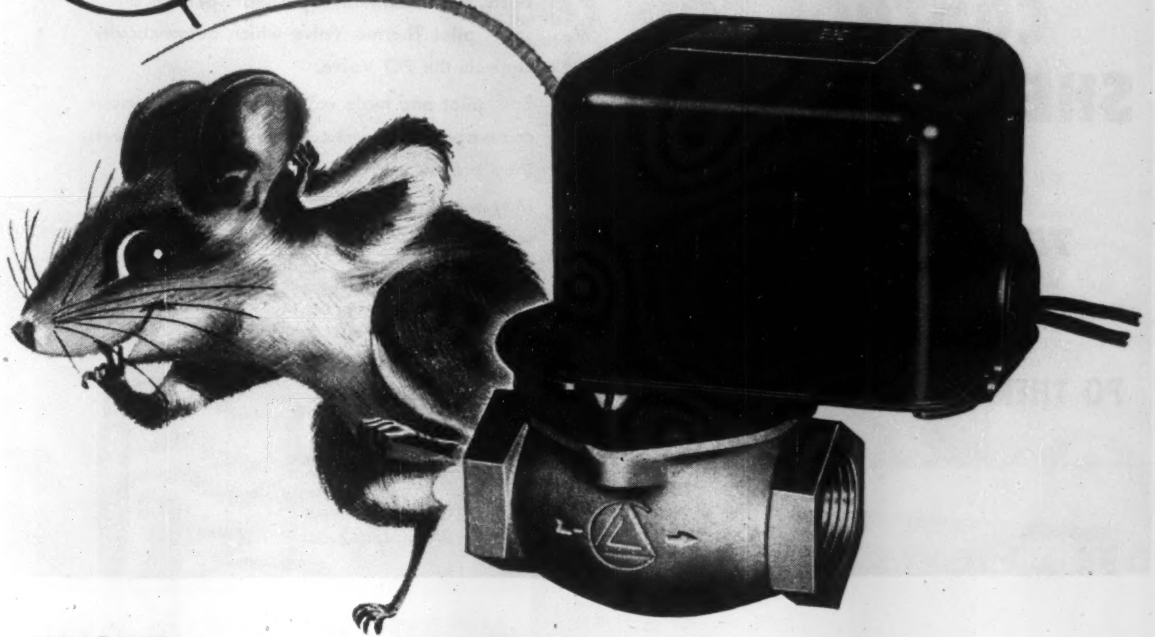
Quiet AS A MOUSE!



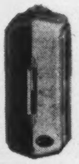
DETROIT V-579 "BI-FLEX"

The Quiet-Acting GAS VALVE—Performance Proven for Reliable Service on Thousands of Installations!

Check These Features

- **Quiet operation—no click, no hum**
- **Rugged, compact—easy to service**
- **Inexpensive**
- **For all gases in all localities**
- **"Bi-flex" motor operated—low voltage**
- **Compensated for changes in ambient temperature**
- **Snap-acting opening and positive closing**
- **½-inch to 1¼-inch sizes**

Here is a gas valve which is actually quiet in operation! Its strong "Bi-flex" motor provides unfaltering opening and tight shut-off closing with absolutely no annoying, worrisome bangs, clicks or hums. Thousands of installations have proved its unsurpassed reliable, trouble-free performance. Simple in design, positive in operation, the V-579 operates independently of gas pressure and is available in sizes to fit any domestic heating system. Write today for Bulletin No. 229.



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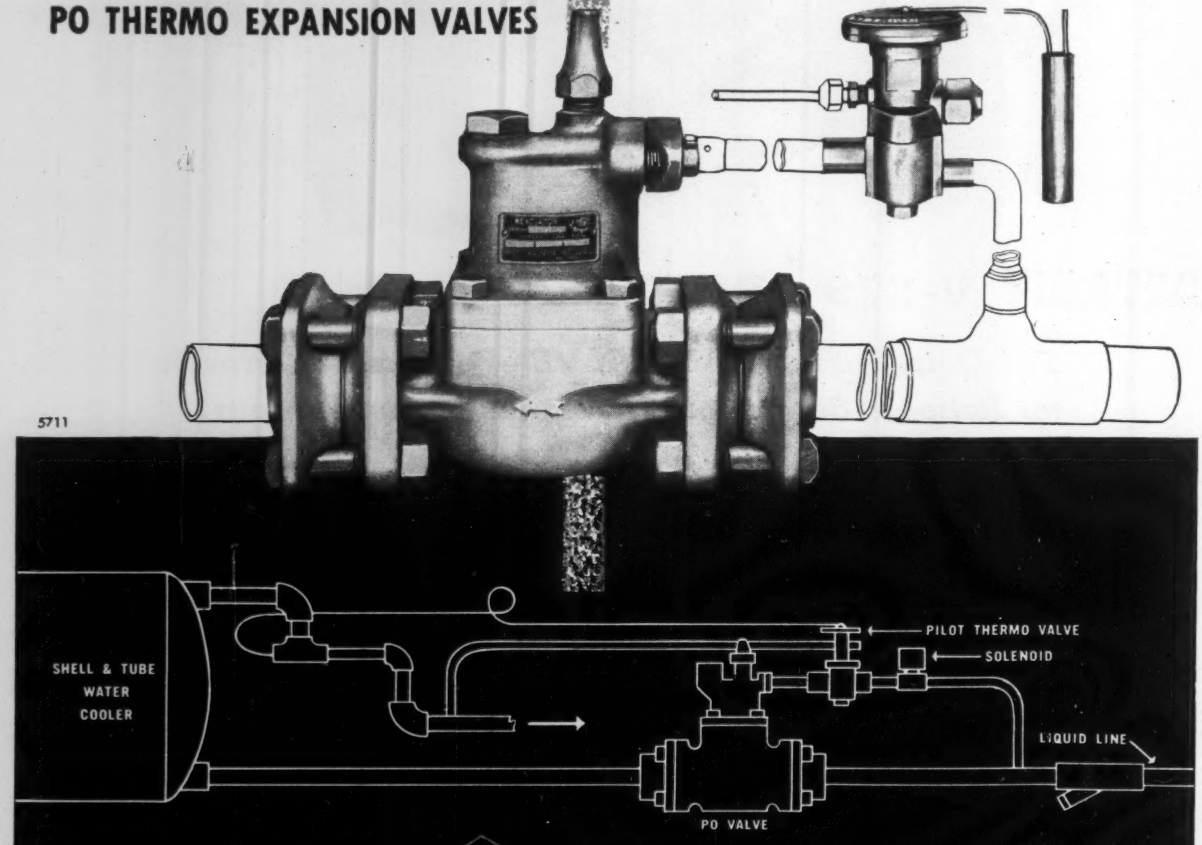

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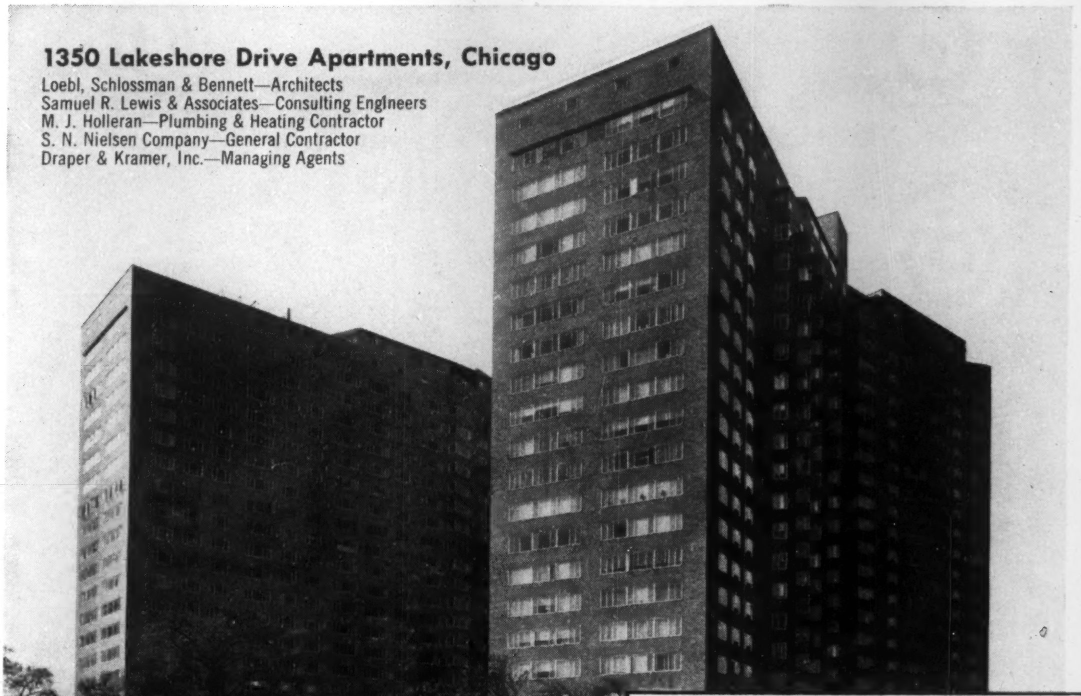

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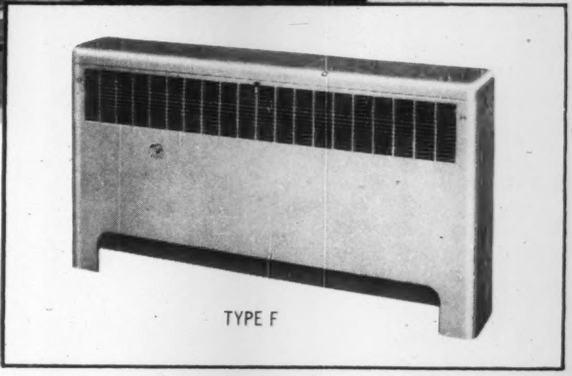

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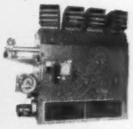

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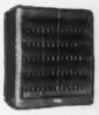
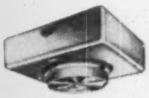
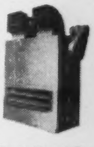


Horizontal Type
Unit Heaters



Vertical Type
Unit Heaters



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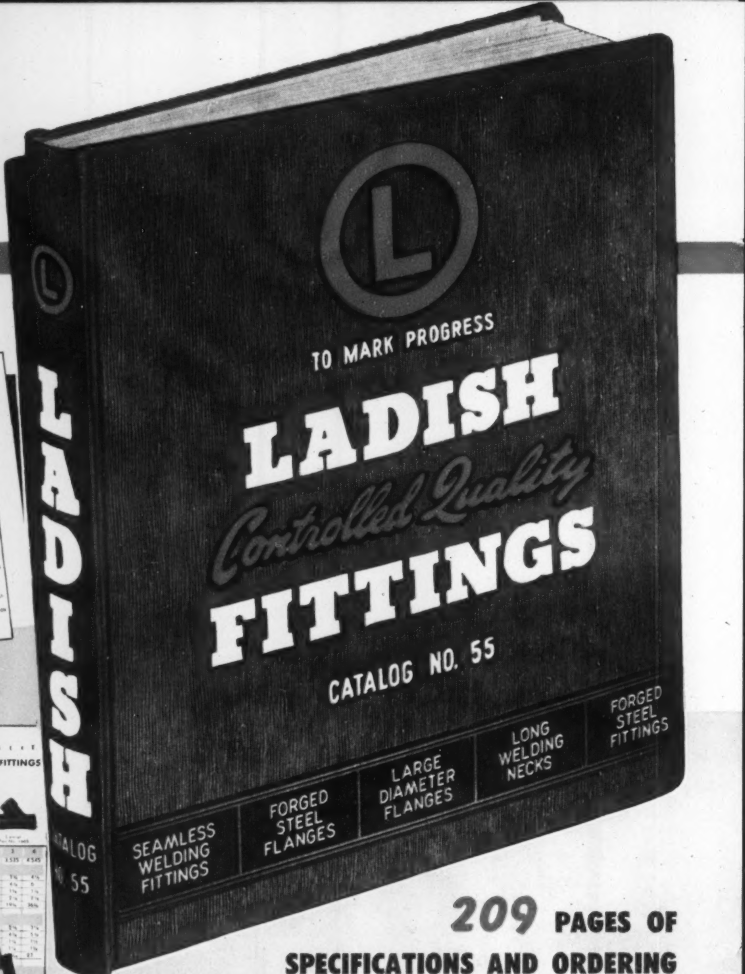
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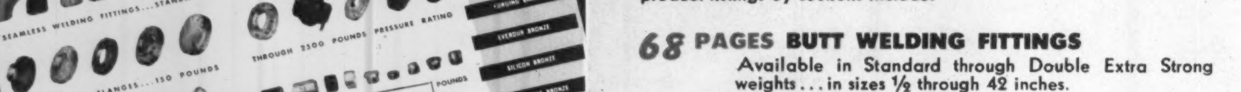

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Tabulations for ½ through 30-inch pipe in a wide selection of wall thicknesses and materials for operating temperatures from 100° F. through 1500° F., in power, district heating, oil transmission, refinery and gas piping systems.

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Dimensional characteristics of carbon, alloy and stainless steel pipe in commonly used nominal sizes and wall thicknesses to help solve problems of anchorage, heat loss and insulation.

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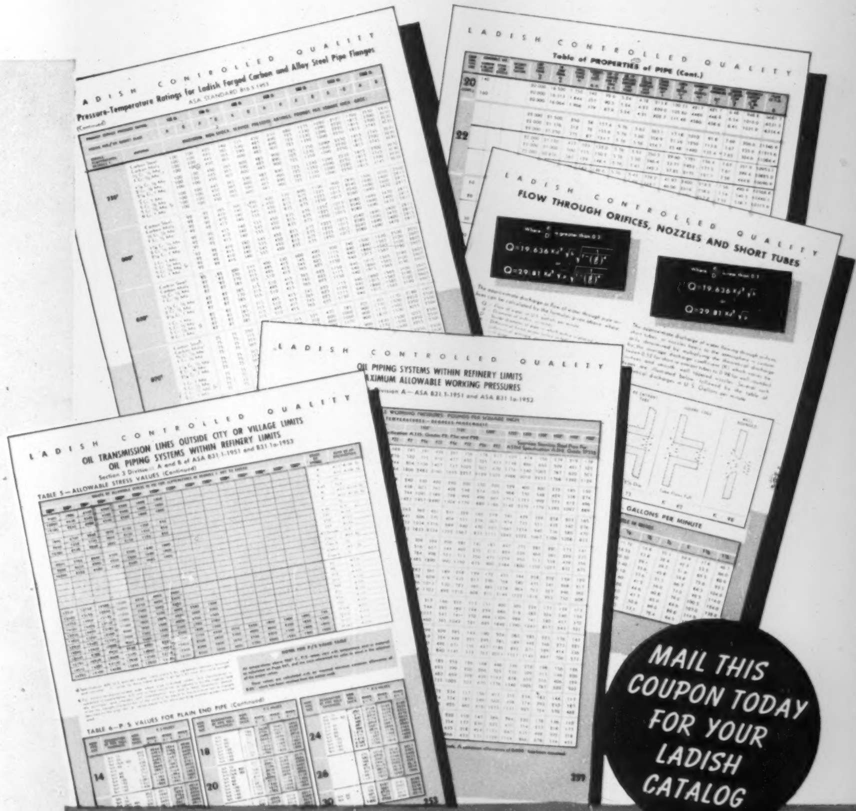

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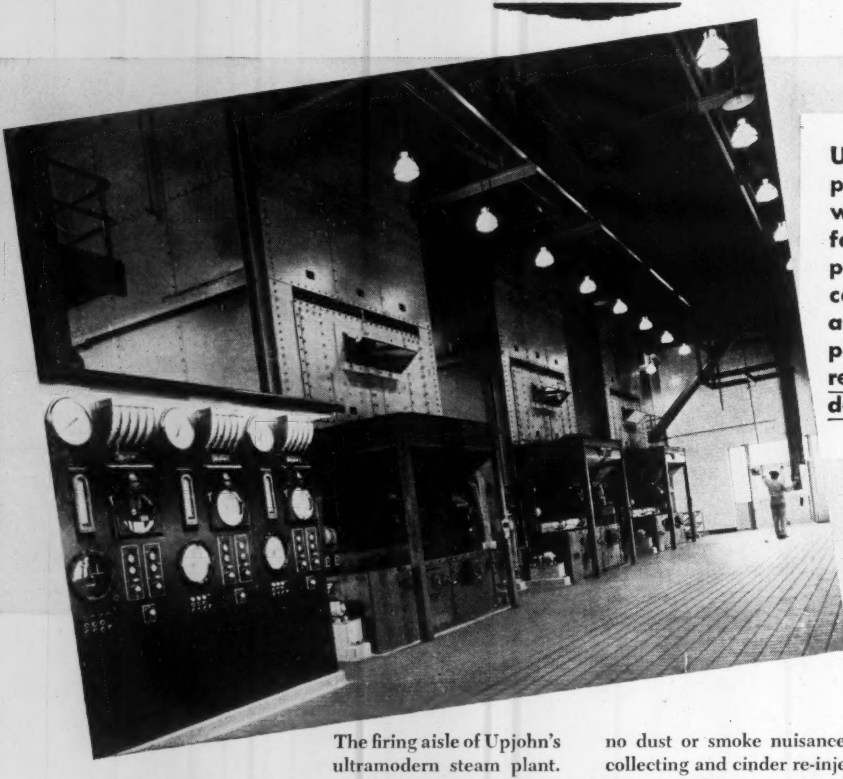
UPJOHN burns **COAL** the modern way!



Upjohn's new pharmaceutical plant which includes units for production of penicillin and cortisone, as well as some 700 other pharmaceutical products, relies on coal for dependable steam!

The firing aisle of Upjohn's ultramodern steam plant. This plant supplies steam, cleanly and efficiently, at only 40¢ to 42¢ per 1,000 lbs. for the Portage Road Plant near Kalamazoo, Michigan. There are no dust or smoke nuisances, thanks to the dust-collecting and cinder re-injection system. Ash handling is fully automatic. These 3 boilers, plus a fourth recently installed (not illustrated), deliver up to 115,000 lbs. steam per hour at peak load.

Whether you're building a new plant or modernizing an older one, you can count on coal for dependability and low-cost operation.

Here's why: Up-to-date coal-burning equipment can give you 10% to 40% more steam per dollar. Automatic coal- and ash-handling systems can cut your labor cost to a minimum. Let a consulting engineer show you how a modern coal installation, tailored for your specific needs, can save you real money.

Here's something else, too—of all fuels, coal alone has virtually inexhaustible resources. This, plus the fact that America's highly mechanized coal industry is the most efficient in the world, assures you of a dependable supply of coal at relatively stable prices now and for years to come.

If you operate a steam plant, you can't afford to ignore these facts!

COAL in most places is today's lowest-cost fuel.

COAL resources in America are adequate for all needs—*for hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

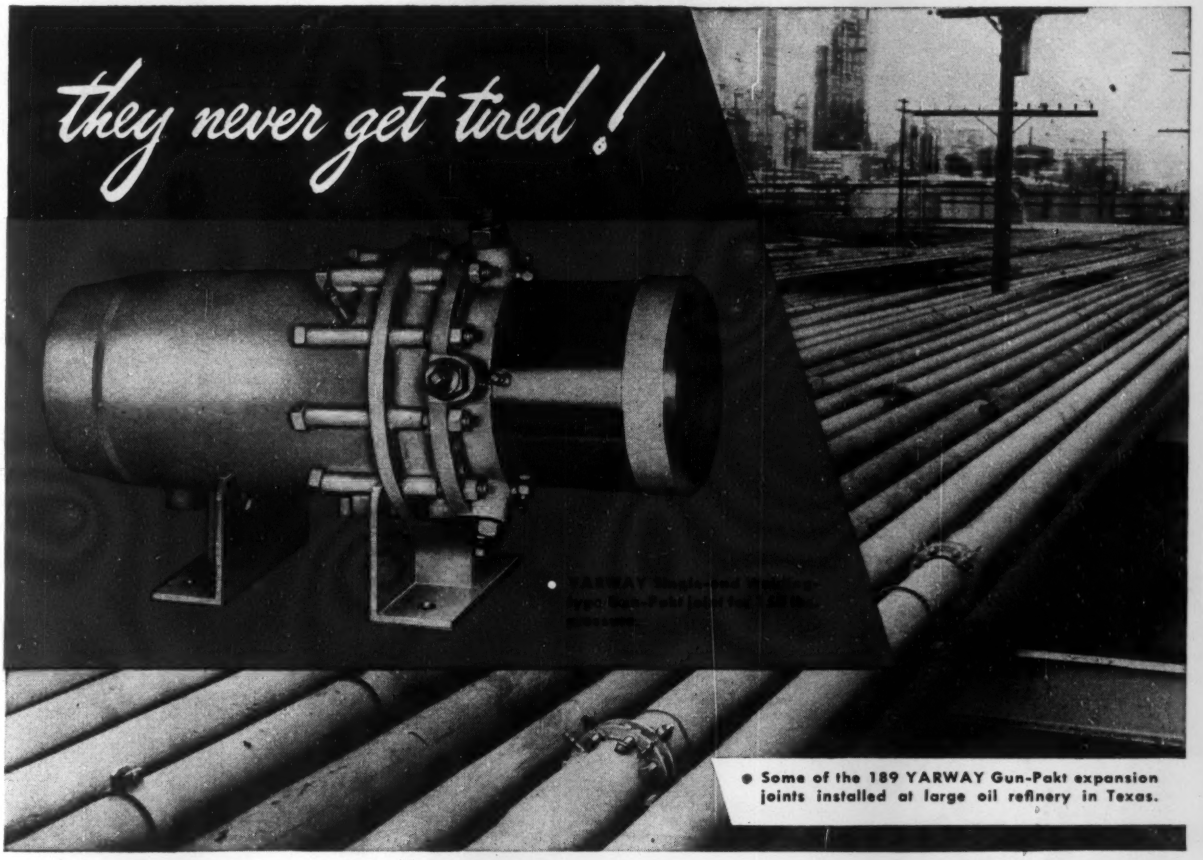
COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

BITUMINOUS COAL INSTITUTE

A Department of National Coal Association, Washington, D. C.

FOR HIGH EFFICIENCY ✦ *FOR LOW COST*

YOU CAN COUNT ON COAL!



YARWAY Single-end Welding-type Gun-Pakt joint for [illegible] lb. pressure.

Some of the 189 YARWAY Gun-Pakt expansion joints installed at large oil refinery in Texas.

No fatigue with 189 YARWAY GUN-PAKT EXPANSION JOINTS at this large Texas refinery

THEY just work and work for years and never get tired. Yarway Gun-Pakt slip-type joints simply will not fail through fatigue. They will operate smoothly, as frequently as required, over long, full traverse up to 12″ single type or 24″ double type or short, partial traverse, day in and day out—with never any danger of metal fatigue or failure.

This is just one of the many big advantages found in Yarway Gun-Pakt expansion joints. Other outstanding Gun-Pakt features are:

1. Can be serviced under *full* steam pressure day and night, thus avoiding costly and inconvenient shutdowns.
2. Fixed Gun-Pakt gland serves as "built in" external guide and permits less costly and rigid pipe guidance than required by many other types of joints.
3. Lower pressure load on end anchors because excessive strains are eliminated.

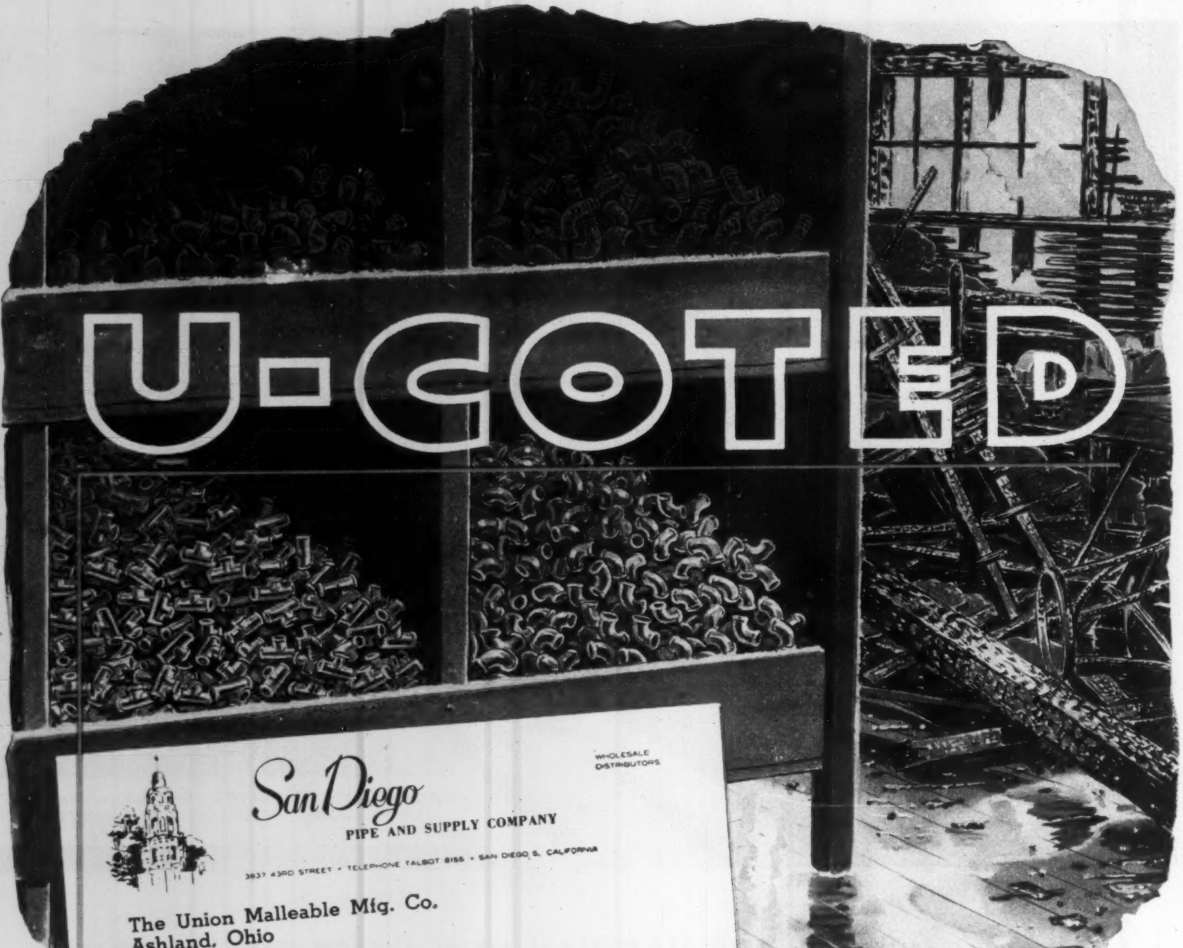
Used for many years with success in well-known refineries, industrial plants, utilities and institutions. When replacing present joints or planning new steam lines, it will pay you to look into the advantages of the Yarway Gun-Pakt expansion joint. Write for Yarway Bulletin EJ-1913.

YARNALL-WARING COMPANY
107 Mermaid Avenue, Phila. 18, Pa.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY

gun-pakt expansion joints

U-COTED



WHOLESALE
DISTRIBUTORS

San Diego
PIPE AND SUPPLY COMPANY

3837 43RD STREET • TELEPHONE TALBOT 8155 • SAN DIEGO 5, CALIFORNIA

The Union Malleable Mfg. Co.
Ashland, Ohio

Dear Sir:

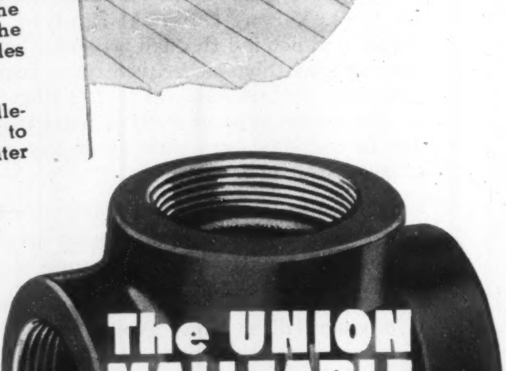
It may be of interest to you to learn of our experience with malleable fittings in connection with our warehouse fire.

The fire was in the back of the building far enough beyond our fitting bins that they did not burn. The firemen, however, had to direct the water from the front of the building, wetting our bins and malleables thoroughly.

The next day, with the exception of your Union Malleable "U" Coated, all the black fittings had started to rust. The "U" Coated fittings withstood all the water damage and are in perfect condition.

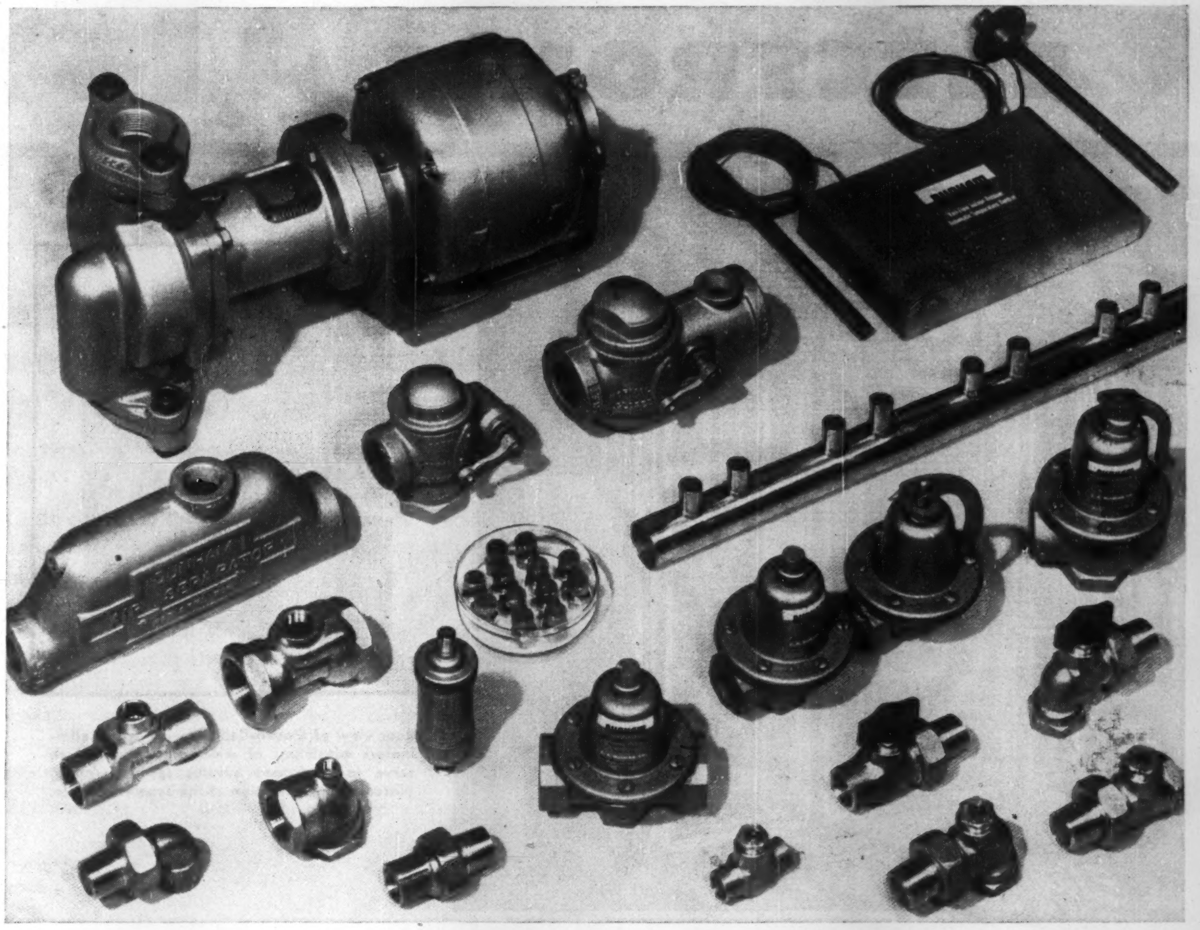
Respectfully,
SAN DIEGO PIPE & SUPPLY CO.

George Wixen
President



The UNION MALLEABLE MFG. CO.
ASHLAND, OHIO U. S. A.

The U-Brand line, both U-COTE and galvanized, includes Malleable Iron Pipe Fittings and Unions — Plugs, Bushings and Floor Flanges — Steel Pipe Nipples — Cast Iron Drainage Fittings and Cast Brass Solder Joint Fittings.

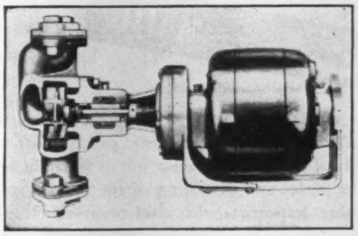


YOU GET TO AND GET OFF THE JOB FASTER WITH DUNHAM'S NEW HOT WATER LINE

You'll Sell, Figure and Install any job faster when you depend on Dunham. As you can see, this line is complete. One order covers everything—circulators, valves, fittings, specialties, controls and *all radiation.* Every item has features designed to simplify installation.

Dunham Circulators, for example, are easy to install with few tools. Selected brand name motors with dynetrically balanced impeller assure quiet, vibration-free pumping.

Dunham's single spring motor coupling simplifies servicing. Stainless steel carbon rotary seals easily replaced in the field. For all the facts, clip and mail the coupon.



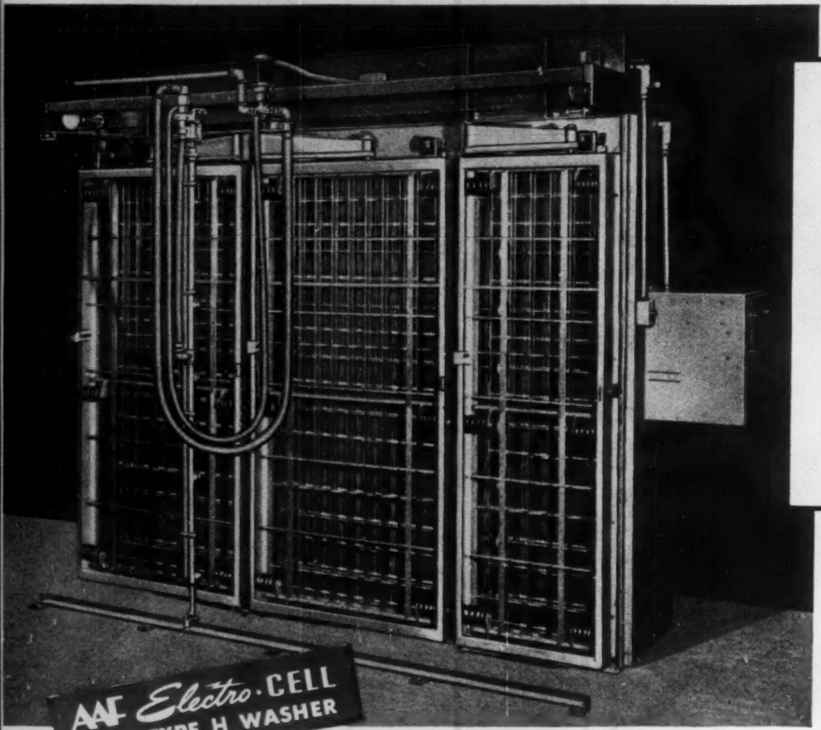
New Dunham Circulator
Standard and High Head Capacities

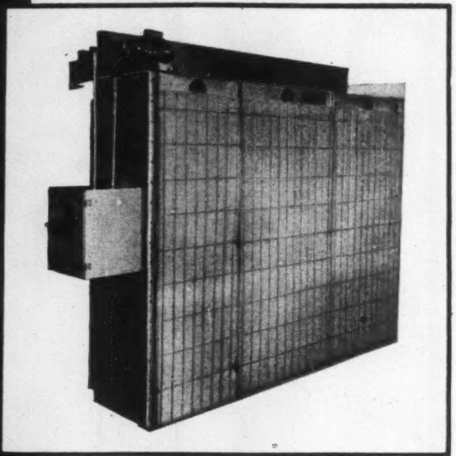
DUNHAM HOT WATER HEATING

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES
QUALITY FIRST FOR FIFTY-ONE YEARS
C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

C. A. Dunham Company
Dept. HPAC-3, 400 W. Madison St.
Chicago 6, Illinois
Send complete Hot Water Line Literature
Name______________________________
Firm______________________________
Address____________________________
City______________Zone____State____

℞ ELECTRONIC AIR





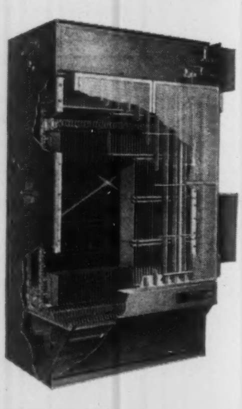
Rear view of Electro-Cell showing water eliminators consisting of Amer-glas pads which serve to catch any surplus spray escaping plates during operation of the Type H Washer.

AAF *Electro*·CELL WITH TYPE H WASHER

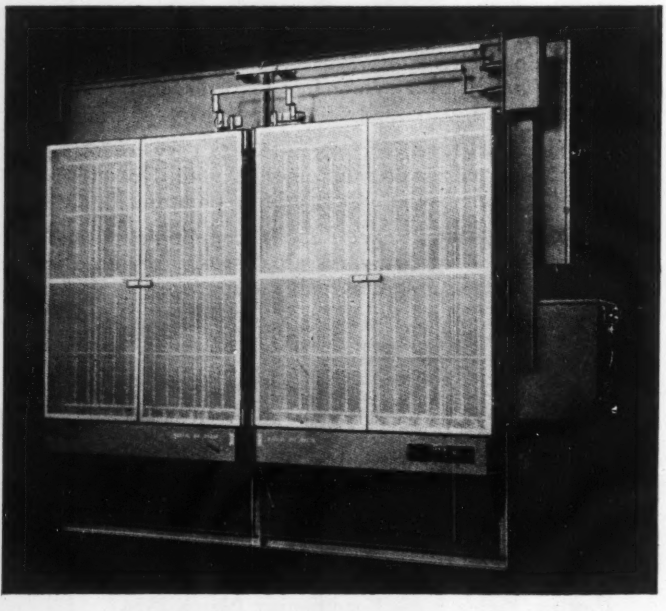
A stationary, plate-type electronic precipitator having a rated efficiency of 90% by the Discoloration Test Method. Addition of the new Type H Washer provides push-button control of complete cleaning operation. Washing and re-oiling of collector plates are accomplished by two separate sets of spray nozzles which travel the full width of the precipitator. Both operations are fully automatic after starting button is pushed. If manual cleaning is preferred, the Electro-Cell's collector plates may be washed and re-oiled in place or easily removed for inspection.

AAF *Electro*·MATIC

A high efficiency (85 to 90% by the Discoloration Test Method), self-cleaning electronic precipitator which automatically eliminates the messy job of washing and re-oiling collector plates and disposing of the precipitated material. Even more important, this exclusive self-cleaning feature minimizes the personal element as a factor of performance and permits continuous operation at maximum efficiency.



Cutaway view of Electro-Matic showing method by which collector plates are cleaned daily by automatic immersion in oil bath to maintain maximum precipitation efficiency.



CLEANING TO YOUR PRESCRIPTION

ONLY AAF OFFERS ELECTRONIC PRECIPITATORS IN A RANGE OF EFFICIENCIES WITH A CHOICE OF MAINTENANCE METHODS

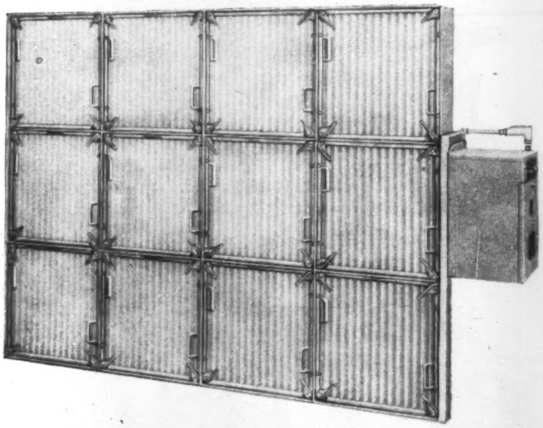
Clean air is our business but the degree of cleanliness desired and the manner in which it is achieved is definitely *your* business. That's why AAF has developed this line of three electronic precipitators. All are highly effective in the removal of dust and smoke, with efficiencies ranging up to 90%—while each offers a different method of maintenance. In addition to the basic benefits, AAF's complete line assures you equipment in a wide range of sizes and air volumes to fit a variety of space requirements—with initial costs varying as to your needs.

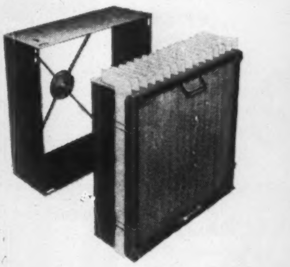
Examine the three units on these pages. Note the features which recognize both the human and dollar factors in those all-important problems of maintenance and performance. That's AAF Research at work—designing clean air to *your* prescription.

Complete information on these Electronic Precipitators is yours without obligation. Remember, too, AAF engineers (the same men who design the products) are always available to point out the short cuts and savings that invariably result with the complete understanding of an air cleaning problem. Call your local AAF representative or write us direct.

AAF Electro·PL

A low-cost, dry-type electronic air filter that combines dry filtration and electronic action. Should the electronic action become inactive, the air will continue to be filtered by the dry-type Airmat media. Maintenance is easy and convenient. No oil is required to retain the precipitated dust. No water and necessary sewer connections are needed for the cleaning operation. When the Airmat paper has accumulated a full dust load, it is discarded and replaced with clean media. Material cost is low and, with every replacement, filter is returned to its original efficiency.





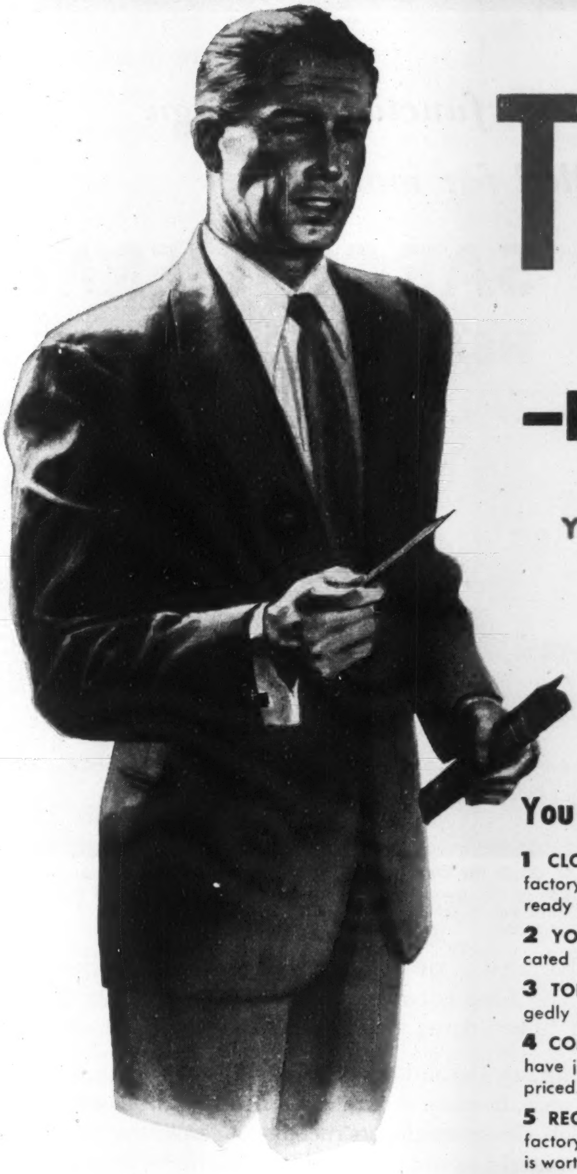
Two components make up an Electro-PL unit—a frame and collector element. The frames, which support the collector elements, are riveted together to form a permanent assembly. Electrical potential for the collector element is supplied by center contact at rear of the frame.

American Air Filter
COMPANY, INC.
373 Central Avenue, Louisville 8, Kentucky • American Air Filter of Canada, Ltd., Montreal, P. Q.

Walworth manufactures a *complete line* of Gate, Globe, Angle, Check, and Lubricated Plug Valves, made of Stainless Steel, Steel, Iron, Bronze, and Special Alloys in a wide range of sizes and temperature-pressure ratings.

Fittings of steel, iron, and bronze are also manufactured in all conventional types and sizes.

WALWORTH
valves and fittings
60 East 42nd Street, New York 17, N. Y.
Distributors in principal centers
throughout the world



THIS MAN

is on your Sales Force —but not on your Payroll

YOUR TYPHOON DISTRICT MANAGER

He's an estimator, a trouble-shooter, a fixer-upper... he's a technical adviser, a crack salesman, he's Johnny-on-the-spot. When the sale hangs in the balance you're mighty glad to have your Typhoon district manager around... you're mighty glad you signed up with Typhoon.

You profit 5 ways with a Typhoon Franchise

1 CLOSE FACTORY COOPERATION • You deal direct with the Typhoon factory. Every member of the organization—right on up to the president—is ready to pitch in and work with you personally.

2 YOUR PARTNER, THE DISTRICT MANAGER... when there's a complicated job to figure... your Typhoon district manager is there to help you.

3 TOPNOTCH ENGINEERING • Typhoon units, open or hermetic, are ruggedly built with plenty of reserve capacity.

4 COMPLETE LINE of packaged air conditioners from 2 to 25 tons. You always have just the size unit your customer wants—when he wants it—competitively priced. You're set up to handle any job in town—efficiently, economically.

5 REGIONAL TRAINING SCHOOLS • intensive sales-engineering course by factory experts, conducted in your own territory. Every employee who attends is worth more money to you!

Write for information about a Typhoon franchise in your territory

Air Conditioning Units 2 to 25 tons • Multi-Packaged Systems up to 60 tons • Evaporative Condensers • Packaged Water Chillers • Air Handling Units... and Typhoon leads in air conditioning for the home — with a complete line of year-round heating-cooling units and heat pumps.

TYPHOON
AIR CONDITIONING

Typhoon Air Conditioning Co., Inc.
794 Union St., Brooklyn 15, N. Y.
P-2

I would like to know more about the Typhoon Franchise.

NAME____

FIRM____

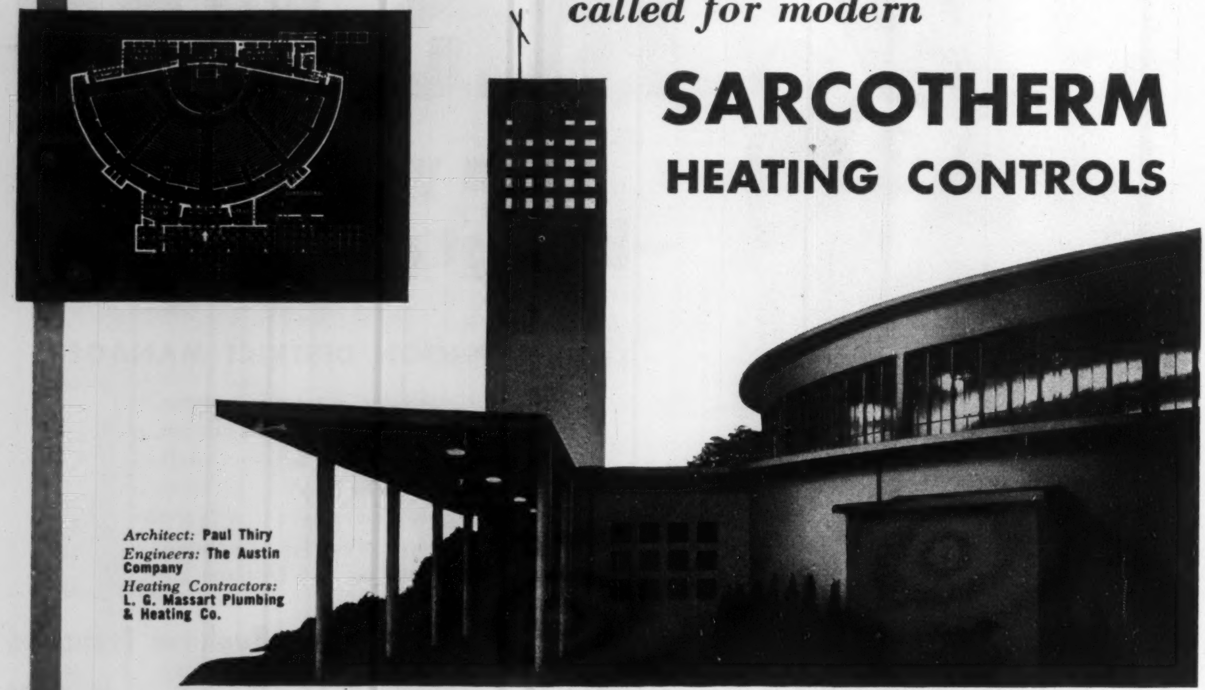
ADDRESS______________________________________

CITY_________________ ZONE______ STATE__________

Specialists in Air Conditioning since 1909
TYPHOON AIR CONDITIONING CO., INC.
794 Union Street · Brooklyn 15 · New York

PAUL THIRY'S *daring, functional design called for modern*

SARCOTHERM HEATING CONTROLS



Architect: **Paul Thiry**
Engineers: **The Austin Company**
Heating Contractors: **L. G. Massart Plumbing & Heating Co.**

CHURCH OF CHRIST THE KING, SEATTLE, WASH. Semi-circular arrangement seats 550 persons with no pew more than 50 feet from altar. Other features: 60-foot carillon tower; covered portico, stained glass clerestory.

ARCHITECT PAUL THIRY'S inspiring design for Church of Christ The King is completely functional from its 60-foot carillon tower down to its weather modulated controls.

Radiant heating and the large attendance expected necessitated an extremely accurate, sensitive control system. To do the job, design engineers specified a Sarcotherm Weather Compensated Control System which insures comfort conditions inside regardless of outside temperatures.

Sarcotherm advantages of simple, low-cost, accurate control plus unique engineering service can help you design and install the most efficient system possible. A Sarcotherm engineer will be happy to advise you on your next project.

For full information on Sarcotherm controls, write for complete catalog.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In A Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings And Wiring Diagrams—not just general drawings but complete, tailor-made drawings and diagrams for each individual job.

On The Job Help—your contractor gets full cooperation and technical assistance backed by many years of specialized experience.

SARCOTHERM CONTROLS, Inc.

Empire State Bldg., New York 1, N. Y.
An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for **HOT WATER, RADIANT AND STEAM** *Heating Systems*

The most convincing stamp of user satisfaction

ANOTHER REPEAT ORDER FOR SARCO

Tuberculosis Hospital, latest addition to Kings County Hospital Center, Brooklyn, New York.

Architect: James Gamble Rogers Successors: Rogers & Butler
Mechanical Engineers: Clark, MacMullen & Riley
Heating Contractors: Fred Brutschy Company, Inc., N.Y.C.
Specification Approval: N.Y.C. Dept. of Public Works

First in 1930 *and seven times since*

Kings County Hospital Center relies on Sarco Heating Specialties

Whenever you find equipment specified and accepted eight times running, you can be sure there's a sound reason for it.

At Kings County Hospital Center, that reason is *Sarco dependability*.

Since 1930, Sarco heating specialties were installed on eight separate jobs. The latest installation was made in the new Tuberculosis Hospital.

Now, over 6000 Sarco products contribute to the dependability and efficiency of Kings County Hospital Center's vitally important heating system and hot water supply. Sarco heating specialties are installed throughout, including the nurses' home, laundry and kitchen. Sarco self-operated temperature regulators are used on hot water storage.

There's no more convincing evidence of Sarco dependability than this impressive record of repeat orders. Specify Sarco on your next job and be assured of similar user satisfaction.

We'd be happy to send you full information on Sarco's complete line of heating specialties.

SARCO

Sarco quality assures satisfaction

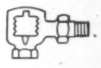
Here's why so many architects, engineers and heating contractors specify and install Sarco

—job after job.

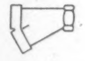
- Proven dependability
- Trouble-free service
- Complete line from one reliable manufacturer
- Nationally known and preferred

SARCO COMPANY, INC., Empire State Building, New York 1, N. Y.
Sarco Canada, Ltd., Toronto 8, Ontario . . . Represented in Principal Cities

STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES

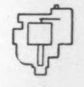


Radiator Valves • Traps



Strainers

Float-Thermostatic Traps



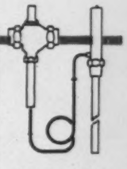
Camlift Bucket Steam Traps

Thermostatic Traps

Water Blenders

Air Eliminators

Dial Thermometers

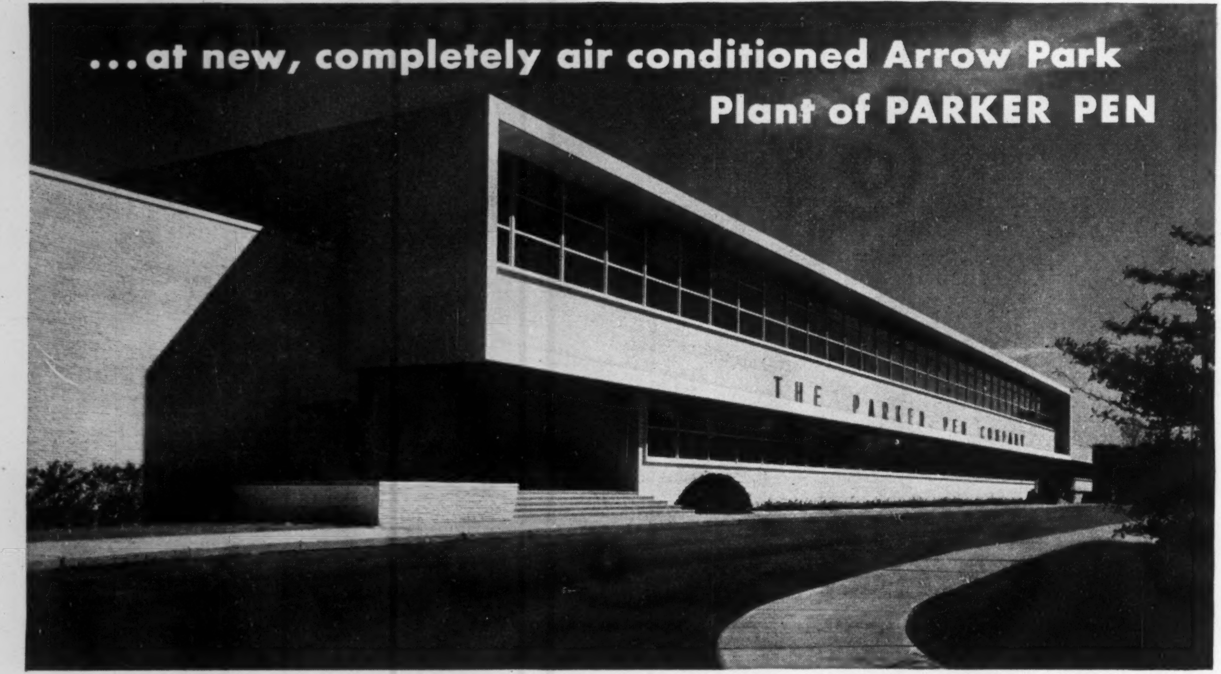


Self-Operated Temp. Reg.

BARBER
COLMAN

"UNI-FLO" ENGINEERED

Air Distribution



. . . at new, completely air conditioned Arrow Park Plant of PARKER PEN

New $4,500,000 home of Parker Pen Co., Janesville, Wis.

Architect: John J. Flad and Associates, Madison, Wis.
Mechanical Engineers: Beling Engineering Consultants, Moline, Ill.
Air Conditioning Contractor: Hyland, Hall & Company, Madison, Wis.
General Contractor: T. S. Willis, and Westphal and Company, Janesville, Wis.

Venturi-Flo Diffusers in the ceiling, Uni-Flo Return Grilles in the sidewalls provide fresh, conditioned air in the cafeteria.

Office staff keeps alert and efficient, works the year 'round in a comfortable, draft-free atmosphere made possible by the soundly engineered air distribution system.

While planning to invest many thousands of dollars in heating and cooling equipment, the makers of famous Parker "51" Pens agreed it would be folly to buy less than the best air distribution devices for their new 212,500 square foot plant in Janesville, Wisconsin. So, accepting the recommendations of the architect, engineer, and contractor, specifications were written for Barber-Colman diffusers and grilles, complete with latest accessories for most efficient air handling.

Two hundred and seventy-five Venturi-Flo Ceiling Diffusers, complete with Volume Controls and Deflectrols, are installed strategically in the offices and production areas. Three hundred and three Uni-Flo Return Grilles with removable cores and Volume Controls have been placed in the sidewalls. Air Turns in the supply ducts, plus double deflection cores mounted alongside fluorescent light units completed the job. The company is assured of the finest air distribution system known today—units which harmonize gracefully with the modern surroundings—units which have proved records for efficient diffusion, quiet operation, easily adjustable deflection and volume control, simplified servicing, and long-life, rigid construction.

You may find it equally wise to protect proposed investments in air conditioning equipment. Call your nearby Field Office for expert engineering assistance, or write us for your free copy of general bulletin F-4471-2.

BARBER-COLMAN COMPANY, DEPT. C, 1101 ROCK ST., ROCKFORD, ILL.

Automatic Controls • Air Distribution Products • Industrial Instruments Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

BANKING

ON THE

BEST!

Throughout California, the familiar Bank of America branches symbolize modern banking facilities at their best. For employee and customer comfort, Utility Blowers are used in 260 Bank of America buildings.

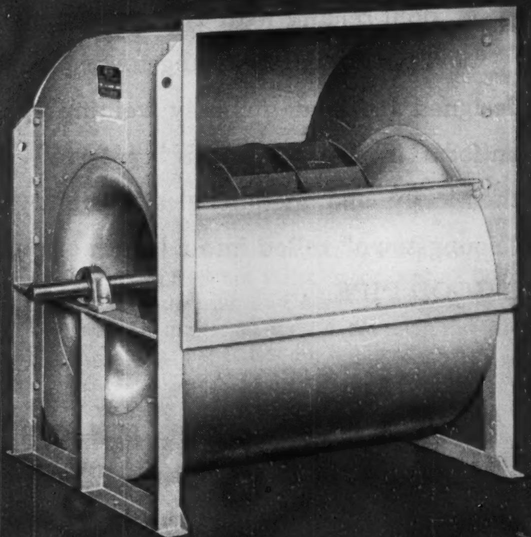
BANK OF AMERICA

Manufacturers of heavy and standard duty blowers for heating, air conditioning and ventilating installations. Producers of blowers and blower parts for original equipment manufacturers. Write for catalogue data.

UTILITY
FAN CORP.
911 EAST 59th STREET
LOS ANGELES 1, CALIFORNIA

A DIVISION OF
UTILITY APPLIANCE CORP.

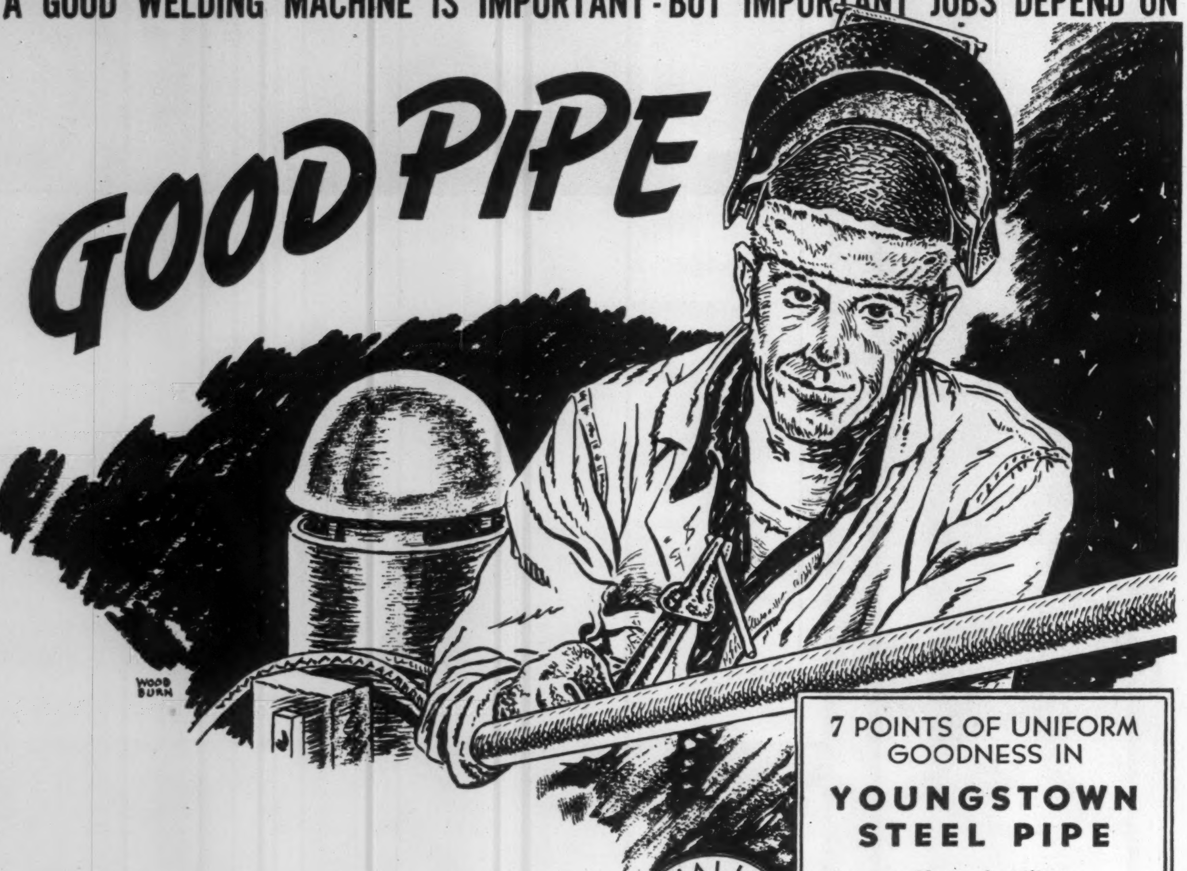
UTILITY



MEMBER OF NATIONAL ASSOCIATION
OF FAN MANUFACTURERS

A GOOD WELDING MACHINE IS IMPORTANT - BUT IMPORTANT JOBS DEPEND ON

GOOD PIPE



QUALITY YOUNGSTOWN SERVICE

NO matter how intricate the weld, you do it readily with Youngstown pipe.

That's because Youngstown pipe is designed and made for easy welding—truly round, uniform in wall thickness, uniformly sized, and chemically and metallurgically right. The name "Youngstown" rolled into a length of pipe means it is GOOD PIPE.

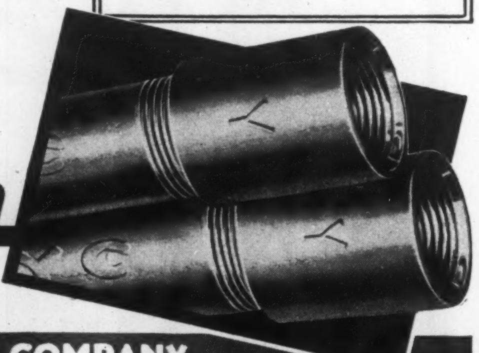
7 POINTS OF UNIFORM GOODNESS IN

YOUNGSTOWN STEEL PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

Youngstown

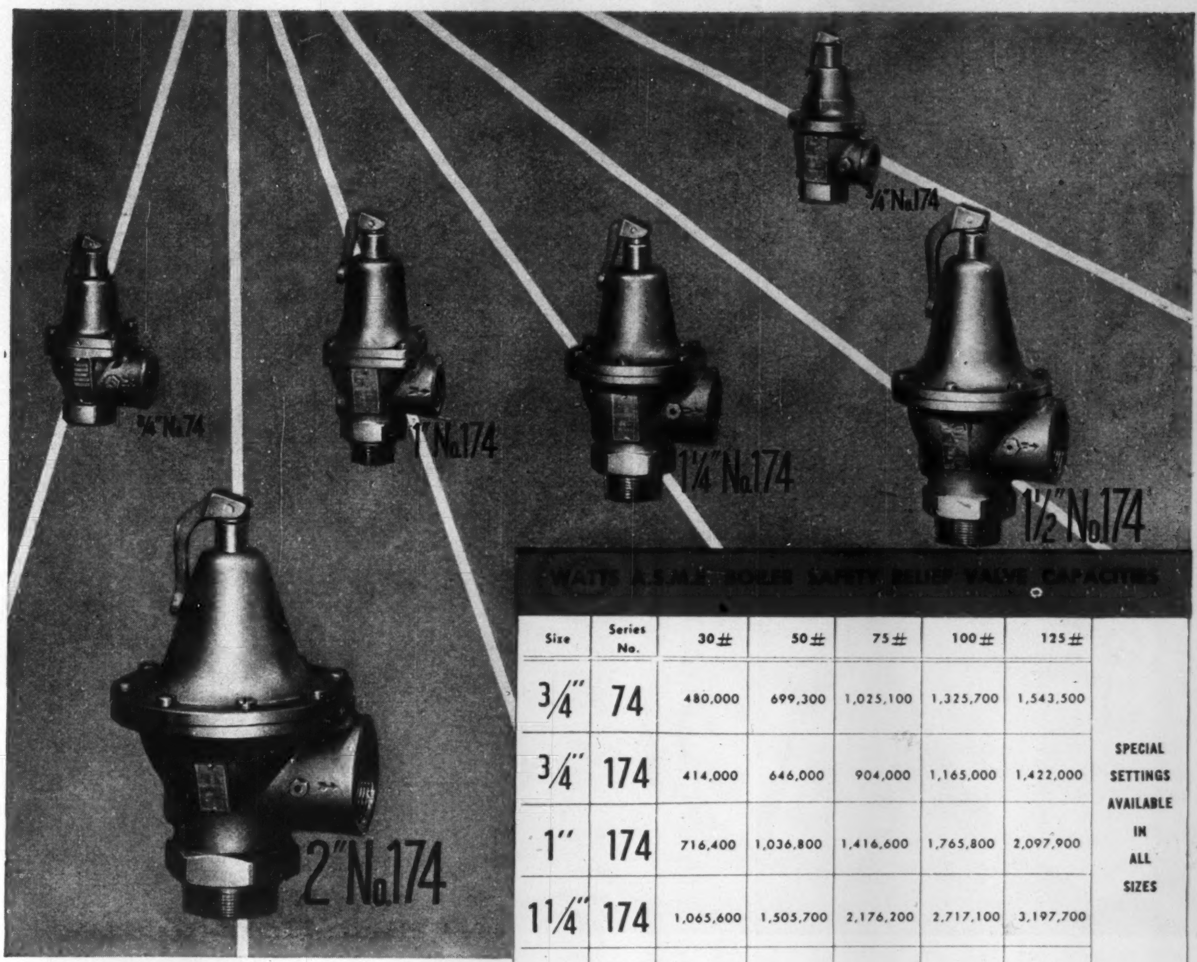
STEEL PIPE



THE YOUNGSTOWN SHEET AND TUBE COMPANY

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

PIPE AND TUBULAR PRODUCTS - CONDUIT - BARS - RODS - COLD FINISHED CARBON AND ALLOY BARS - SHEETS - PLATES - WIRE - ELECTROLYTIC TIN PLATE - COKE TIN PLATE - RAILROAD TRACK SPIKES



WATTS A.S.M.E. BOILER SAFETY RELIEF VALVE CAPACITIES

Size	Series No.	30 #	50 #	75 #	100 #	125 #	
¾"	74	480,000	699,300	1,025,100	1,325,700	1,543,500	SPECIAL SETTINGS AVAILABLE IN ALL SIZES
¾"	174	414,000	646,000	904,000	1,165,000	1,422,000	
1"	174	716,400	1,036,800	1,416,600	1,765,800	2,097,900	
1¼"	174	1,065,600	1,505,700	2,176,200	2,717,100	3,197,700	
1½"	174	1,395,000	2,065,500	2,835,000	3,636,900	4,333,500	
2"	174	2,528,100	3,638,700	4,731,300	6,225,300	7,039,800	

WATTS COMPLETE LINE

OF A.S.M.E. RATED SAFETY RELIEF VALVES FOR ALL HOT WATER BOILERS

Regardless of size or capacity, you can supply the correct safety relief valve for every job from the Watts line—the only complete line. Six different sizes and many graded pressure settings with corresponding BTU/HR discharge capacities are available. Nearly every boiler can be protected with only one Watts safety relief valve because of this practical selection.

Watts ¾" No. 74 alone provides adequate protection for 80% of all hot water space heating boilers. Institutions, industrial, and commercial installations have need for the larger sizes of the No. 174 where higher discharge capacities are required.

Stocked by your wholesaler — Write for Folder F174.

WATTS REGULATOR COMPANY

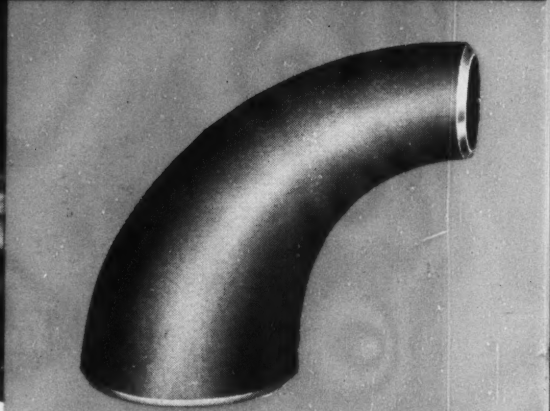
Plumbing and Heating Safety Valves and Controls

WATTS
LAWRENCE MASS. U.S.A.

Since 1875

LAWRENCE, MASSACHUSETTS

SIMPLE and EASY TO USE



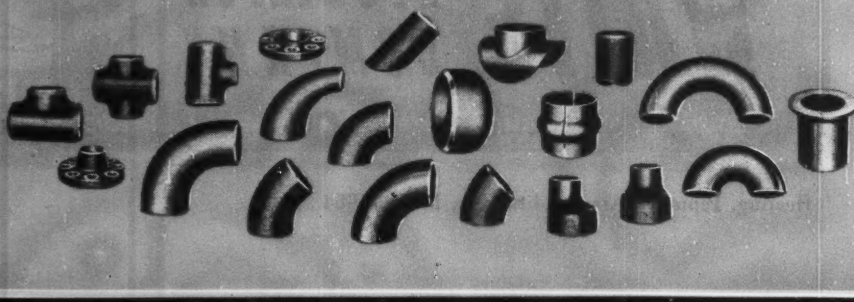
Midwest Reducing Elbow replaces two fittings: (1) a straight size elbow and (2) a reducer. One weld is eliminated with a resultant saving in layout time, welding, and cost. Pressure drop is reduced, appearance is improved and the piping is easier to insulate. Sizes to 16", reductions to half size.

Children get the hang of a bubble pipe almost by instinct . . . it's so simple and easy to use. Pipe welders report that they find Midwest Welding Fittings simple and easy to use because they are so uniform . . . so accurate to dimension . . . and because of their greater variety. Representative of this greater variety is the Midwest Reducing Elbow (shown at right) which takes the place of a standard elbow and a reducer . . . requires only two welds instead of three. For more information on why Midwest Welding Fittings are simple and easy to use, ask for Catalog 54.

MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Passaic, Los Angeles and Boston
Sales Offices:
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Los Angeles 33—520 Anderson St. • Houston 2—1213 Capitol Ave.
Tulsa 3—224 Wright Bldg. • Boston 27—426 First St.
STOCKING DISTRIBUTORS IN PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

MIDWEST
WELDING FITTINGS
Improve Piping Design and Reduce Costs



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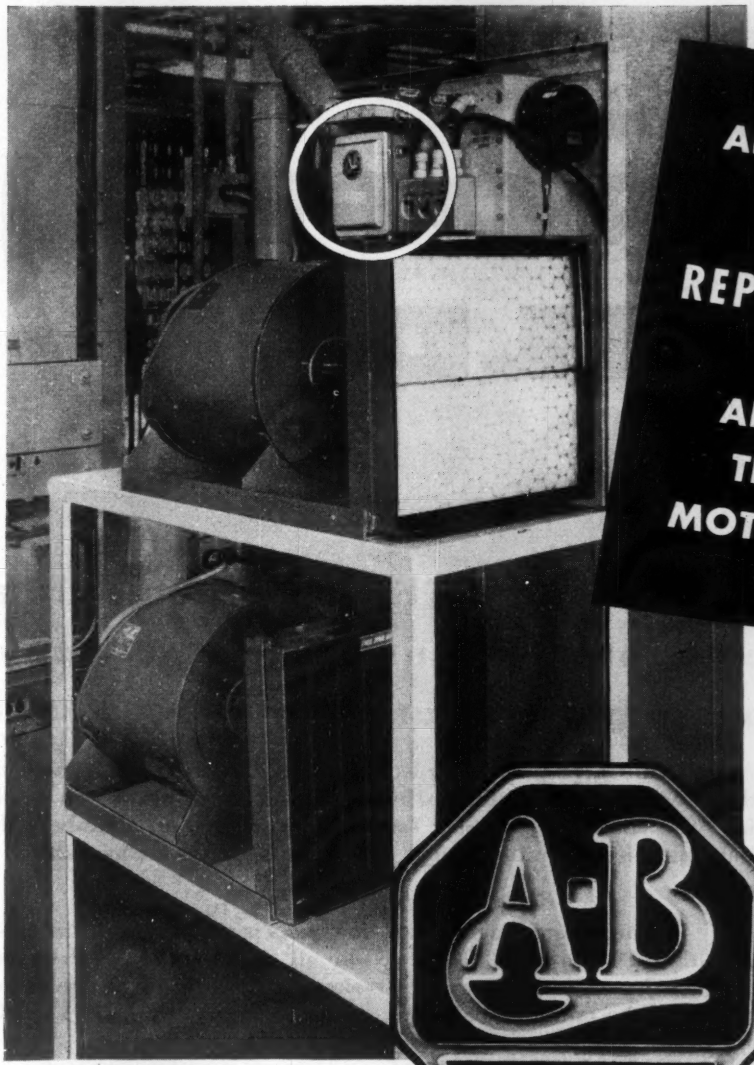


Air cleaning system for AT&T repeater station. Blower controlled by Allen-Bradley Starter.

Air Cleaning System Blowers for AT&T REPEATER STATIONS

equipped with

ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

A-B Quality

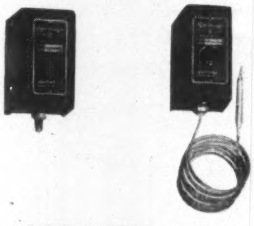
Clean air is needed to secure proper cooling of vacuum tubes in American Telephone & Telegraph repeater stations. Blowers, fitted with special filters and controlled by reliable Allen-Bradley controls, provide the required flow of clean air.

Why are Allen-Bradley starters so popular for air-conditioning service? . . . Because they do not require regular attention, they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them! Furthermore, Allen-Bradley cadmium silver alloy contacts never need cleaning, filing, or dressing. Dependable overload relays remain accurate in their operation, even after long service.

Allen-Bradley Co
1335 S. First St., Milwaukee 4, Wis.

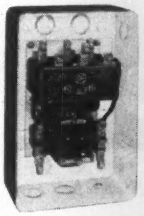
Typical Refrigeration Controls

PRESSURE AND TEMPERATURE CONTROLS



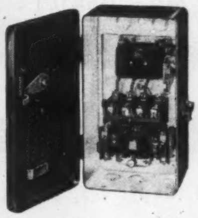
A-B Bulletin 836 pressure control and A-B Bulletin 837 temperature control. Accurate, rugged, compact units.

AUTOMATIC STARTER



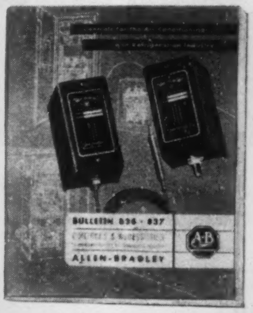
A-B Bulletin 709 solenoid starter. Note white interior for ease of wiring.

COMBINATION STARTER



A-B Bulletin 712 disconnect switch type combination starter. Saves installation time.

Write **for This Allen-Bradley Air Conditioning and Refrigeration Bulletin**

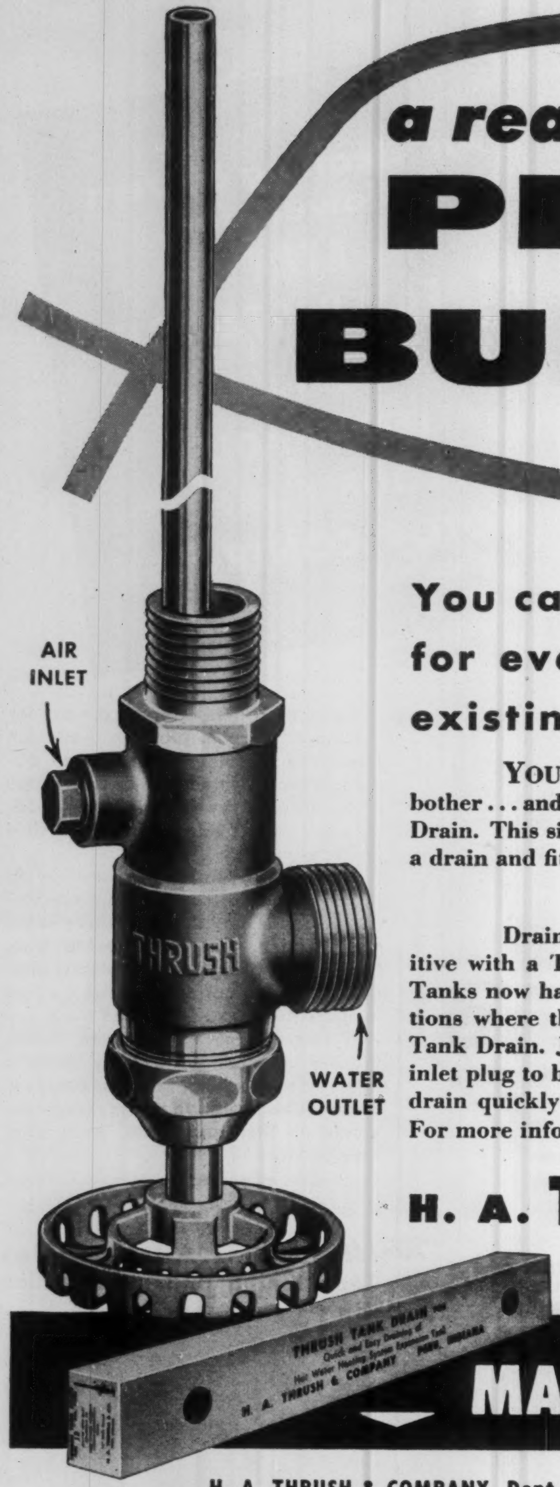


BULLETIN 836 · 837

ALLEN-BRADLEY

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

a real... PROFIT BUILDER


AIR INLET
THRUSH
WATER OUTLET
NEATLY BOXED
THRUSH TANK DRAIN
Quick and Easy Draining of Hot Water Heating System Expansion Tank
H. A. THRUSH & COMPANY PERU, INDIANA

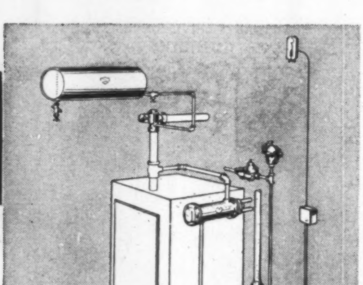
You can sell a THRUSH Tank Drain for every expansion tank on any existing installation

YOU CAN SAVE your customer money, save yourself time and bother . . . and make a profit, too, by selling and installing Thrush Tank Drain. This simple, inexpensive Tank Drain combines an air tube with a drain and fits any drain tapping. Two lengths of tube are available.

REDUCES DRAINING TIME!

Draining waterlogged expansion tanks is simple, quick and positive with a Thrush Tank Drain. While all genuine Thrush Pressure Tanks now have Thrush Vacuum Breaker, there are many old installations where the tank has only one drain tapping. Sell them a Thrush Tank Drain. Just screw it into the drain tapping. Then remove the air inlet plug to break the vacuum and open the water outlet. The tank will drain quickly and completely. It's a profit item you can sell every day. For more information see your wholesaler or use the coupon below.

H. A. THRUSH & COMPANY



Complete Thrush System

MAIL NOW!

H. A. THRUSH & COMPANY, Dept. E-3, PERU, INDIANA

Please send, without obligation, more information on the Thrush Tank Drain.

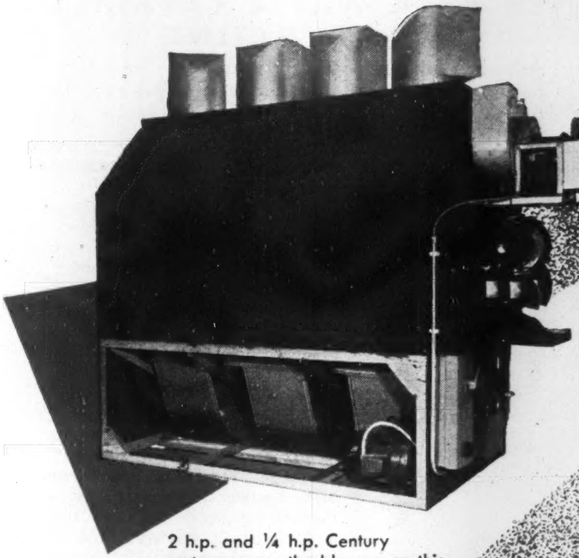
NAME ____________________

ADDRESS ____________________

CITY ____________ STATE ____________

FOR PERFORMANCE YOU'LL BE PROUD OF . . .

Century
MOTORS
PAY OFF
IN PLEASED
CUSTOMERS

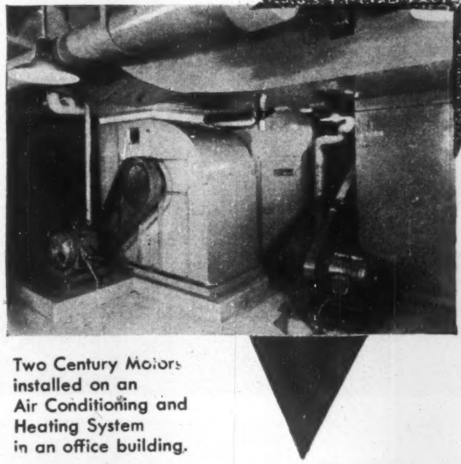


2 h.p. and ¼ h.p. Century motors power the blowers on this popular, direct-fired unit heater for commercial and industrial installation.

Even years after you've made a Century motor-powered installation you'll continue to win praise from your customers for its quiet running and efficient operation.

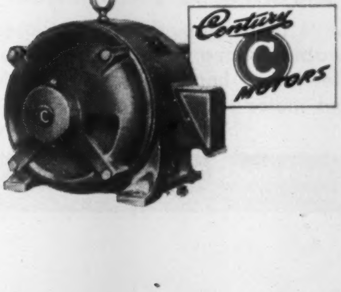
Leading manufacturers of heating, ventilating and air conditioning equipment choose Century motors to bring out the best performance in their products. The wide range of Century motor sizes and types enables them to select exactly the right motor design and torque characteristics to do the job best.

For help with your motor problems—replacement or new applications—consult the Century Branch Office nearest you, or conveniently located Century distributor. A nationwide network of Century Service Stations is always at your service to help you keep your customers happy.



Two Century Motors installed on an Air Conditioning and Heating System in an office building.

400 TO 1/8 HORSEPOWER



CENTURY ELECTRIC COMPANY
1806 Pine Street • St. Louis 3, Missouri
Offices and Stock Points in Principal Cities

813

HOFFMAN VACUUM PUMPS

WITH PEAK WATER CAPACITY 280% OF RATING

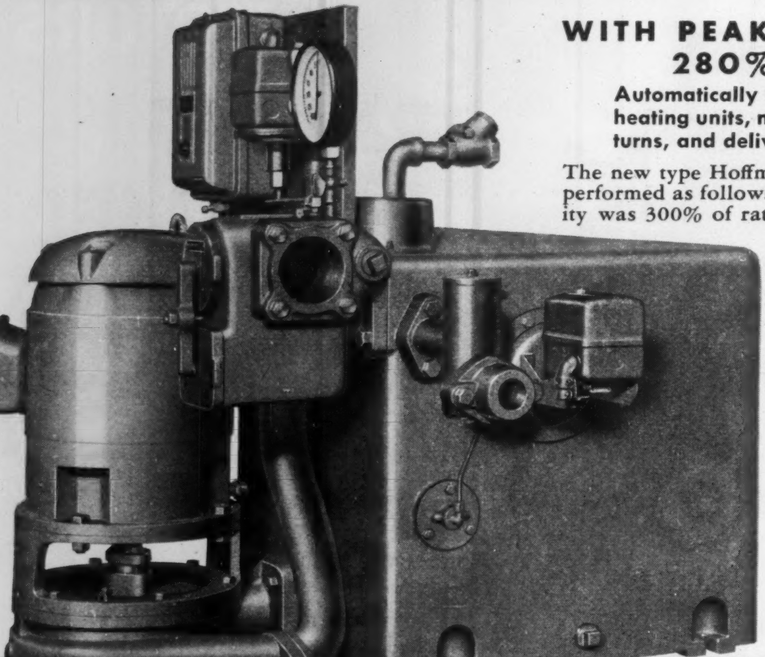
Automatically removes air and water from heating units, maintains a vacuum in the returns, and delivers condensate to the boiler

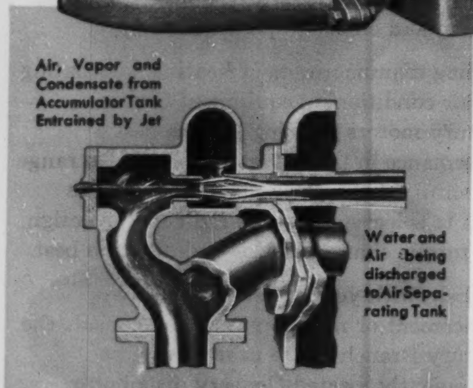
The new type Hoffman Vacuum Pump on official test performed as follows: When started cold, the air capacity was 300% of rating. When air was exhausted and the flood of initial condensate reached the pump, it was removed at the astounding speed of 280% of rated capacity.

At 160° water temperature and 6" vacuum, pump capacity was 100% for simultaneous removal of air and water. Note the simultaneous performance!

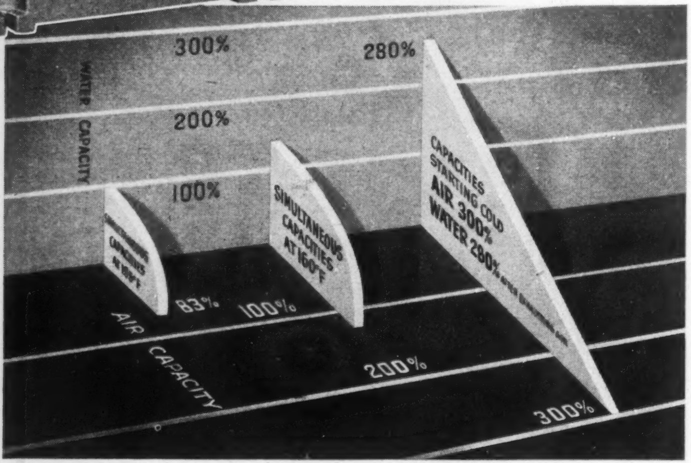
At 195° water temperature and 3" vacuum, the pump discharged 83% of rated capacity in air and 100% in water.

These Hoffman performance figures defy comparison. Remember, too, that all this super-efficiency is available at lower maintenance cost due to the featured Hoffman Jet-Type Vacuum Producer.




Air, Vapor and Condensate from Accumulator Tank Entrained by Jet
Water and Air being discharged to Air Separating Tank

JET VACUUM PRODUCER ENABLES PUMP TO HANDLE ALMOST BOILING WATER

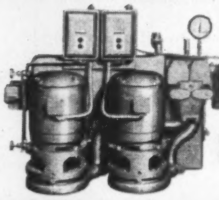


CAPACITIES: From 2,500 to 100,000 sq. ft. EDR.

DISCHARGE PRESSURES: From 20 lbs. to 60 lbs. per sq. in.

● Bronze fitted throughout ● Enclosed, precision balanced bronze impeller ● Renewable bronze wearing ring ● Split bronze packing gland ● Stainless steel impeller hub ● Impeller has top suction inlet—eliminates air or vapor binding ● Rigid motor support, very quiet ● Easily handles 200°F condensate.

Write today for Cat. No. VP 853, no obligation.



DUPLEX UNITS

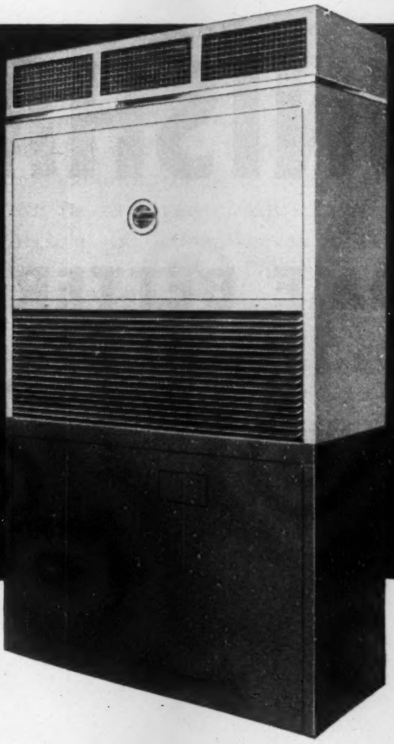
HOFFMAN SPECIALTY MFG. CORP. • 1001 York Street, Indianapolis 7, Indiana

Makers of Valves, Traps, Hot Water Heating Systems, Vacuum and Condensation Pumps — Sold by Leading Wholesalers of Heating and Plumbing Equipment

1 *of the many reasons why you will find it pays to sell Chrysler Airtemp*

"Packaged" air conditioning by CHRYSLER AIRTEMP

costs less to install!



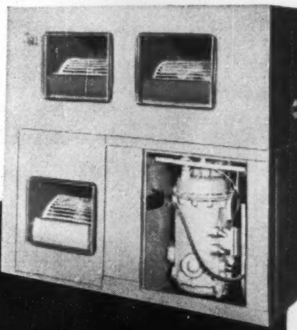
"Packaged" Air Conditioners in six water-cooled models, from 2 to 15 H.P.

● A Chrysler Airtemp "First", the famous radial compressor permits perfect balance. Rubber compressor suspension and flexible connections in suction and discharge lines further reduce noise and vibration. Combined, these features assure such quiet operation you can install a Chrysler Airtemp "Packaged" Air Conditioner within or very close to the area to be cooled. Thus ductwork is eliminated or greatly minimized to cut your installation costs.

All units are shipped *completely* factory-assembled. To facilitate installation, you have a choice of three different ways of directing the conditioned air. You can even "split" a unit, placing compressor assembly on floor and balance above shelving or other fixed objects.

Easier, faster installation saves costly man-hours, gives you an important competitive advantage. But it's only one of many big reasons why it will pay you to sell Chrysler Airtemp! Check seven of these reasons in list at right . . . then mail coupon for complete details.

REPLACEMENT OR REFUND OF MONEY ★ Guaranteed by Good Housekeeping IF NOT AS ADVERTISED THEREIN



New "Packaged" Air-Cooled Air Conditioners—*no water needed*, no plumbing required. 2, 3 and 5 H.P.

CHRYSLER AIRTEMP

heating • air conditioning for homes, business, industry

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

7 *more advantages you sell with when you sell Chrysler Airtemp . . .*

- **Consumer Confidence**—people know the Chrysler Airtemp name—associate it with engineering leadership—have confidence in the products which carry it.
- **More Units in Use**—Chrysler Airtemp pioneered "Packaged" Air Conditioning in 1937, has more units in use today than any other manufacturer.
- **Advanced Engineering** by Chrysler Airtemp offers your customers features that mean more because they do more for them.
- **Assured Dependability**—all units manufactured to exacting standards of precision in a windowless, completely air conditioned factory. Each unit is thoroughly inspected and tested, using special equipment and methods, to assure dependable performance in the field.
- **More Complete Line**—9 models meet all requirements.
- **More National Advertising** to all prospects and specific benefit advertising to individual businesses—the best markets for "Packaged" Air Conditioning.
- **More Local Selling Helps**—the broadest line of tested and proved local selling helps for dealers.

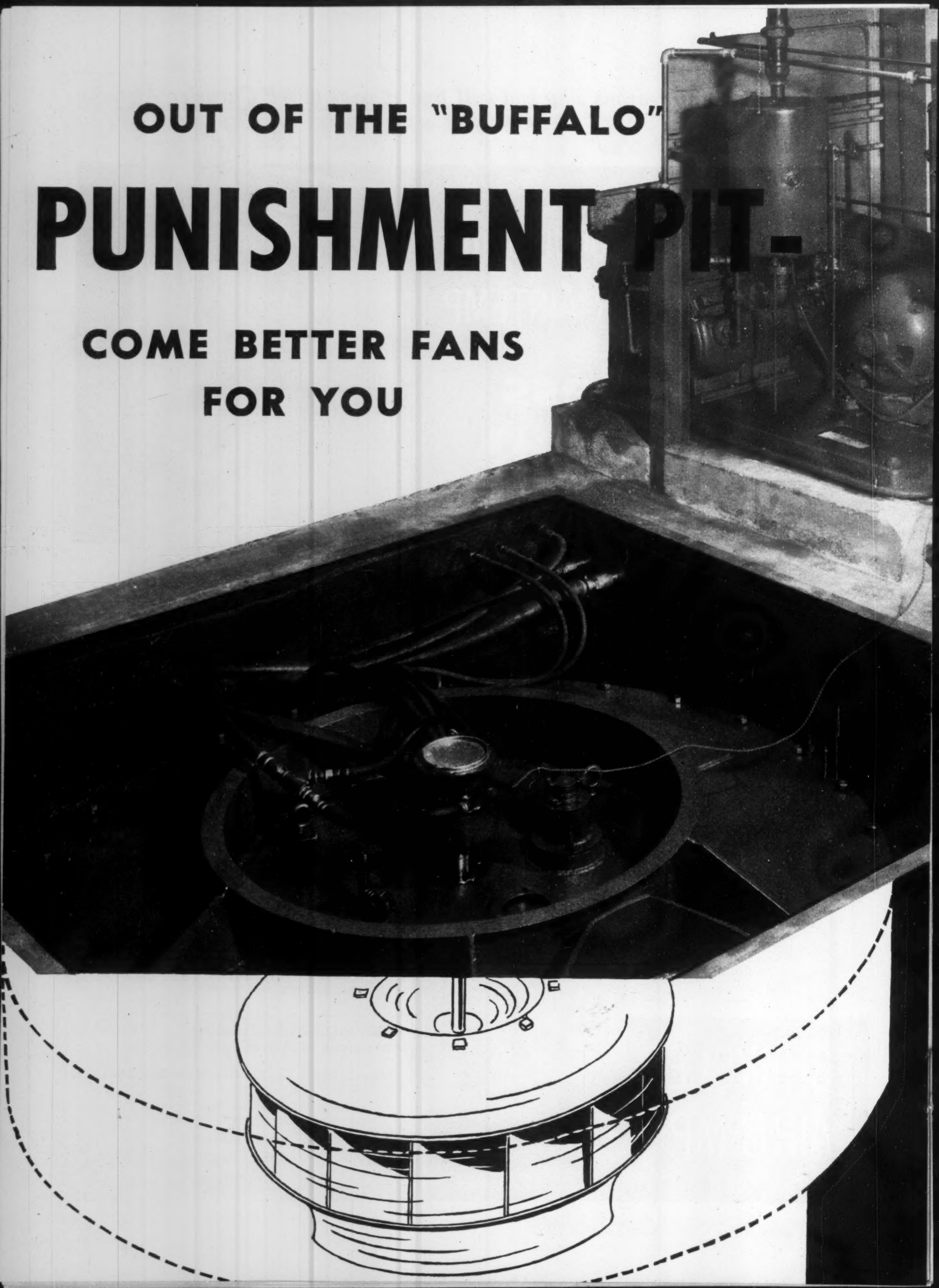
Airtemp Division of Chrysler Corporation HP&AC-3-54
P.O. Box 1037, Dayton 1, Ohio

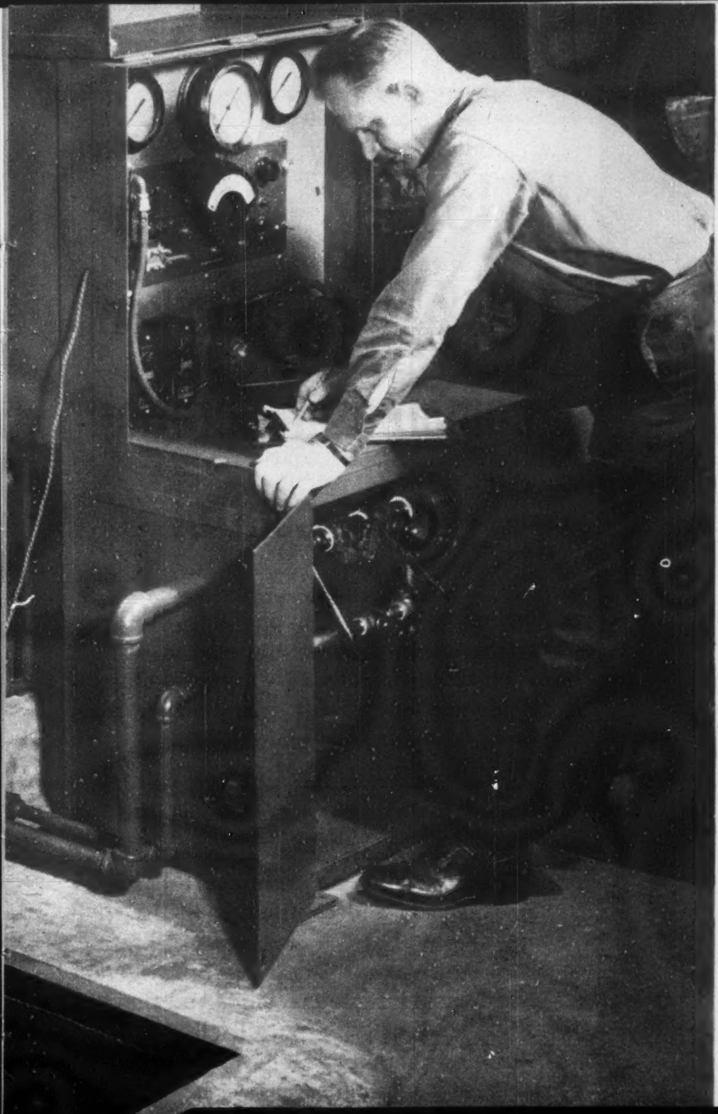
I would like to know more about the Chrysler Airtemp Franchise.

Name____________________

Address____________________

City__________ Zone____ State______

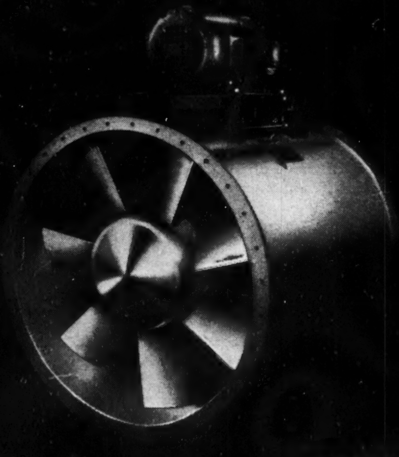

OUT OF THE "BUFFALO"
PUNISHMENT PIT-
COME BETTER FANS
FOR YOU



- To be sure that "Buffalo" rotors can stand far greater stress than they would ever encounter in an installation, we deliberately try to destroy them in this "Buffalo" vacuum test pit! Here, in a partial vacuum, the rotor to be tested can be revolved at tip speeds as high as 60,000 and even 70,000 feet per minute. The slightest unbalance, the slightest structural weakness, would result in destruction of the rotor at these fantastic speeds — and it shows up here in the Punishment Pit, not in the installed fan.

This is just one phase of the rigid testing and excellence of engineering, or "Q" Factor*, which assure you of a best buy when you specify "Buffalo" Fans. Why not write for "Buffalo" engineering literature on *your* air handling problem?

***The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.**



Left, "Buffalo" Axial Flow Fan

•

Right, "Buffalo" Type "BL" Limit-Load Ventilating Fan

BUFFALO FORGE COMPANY

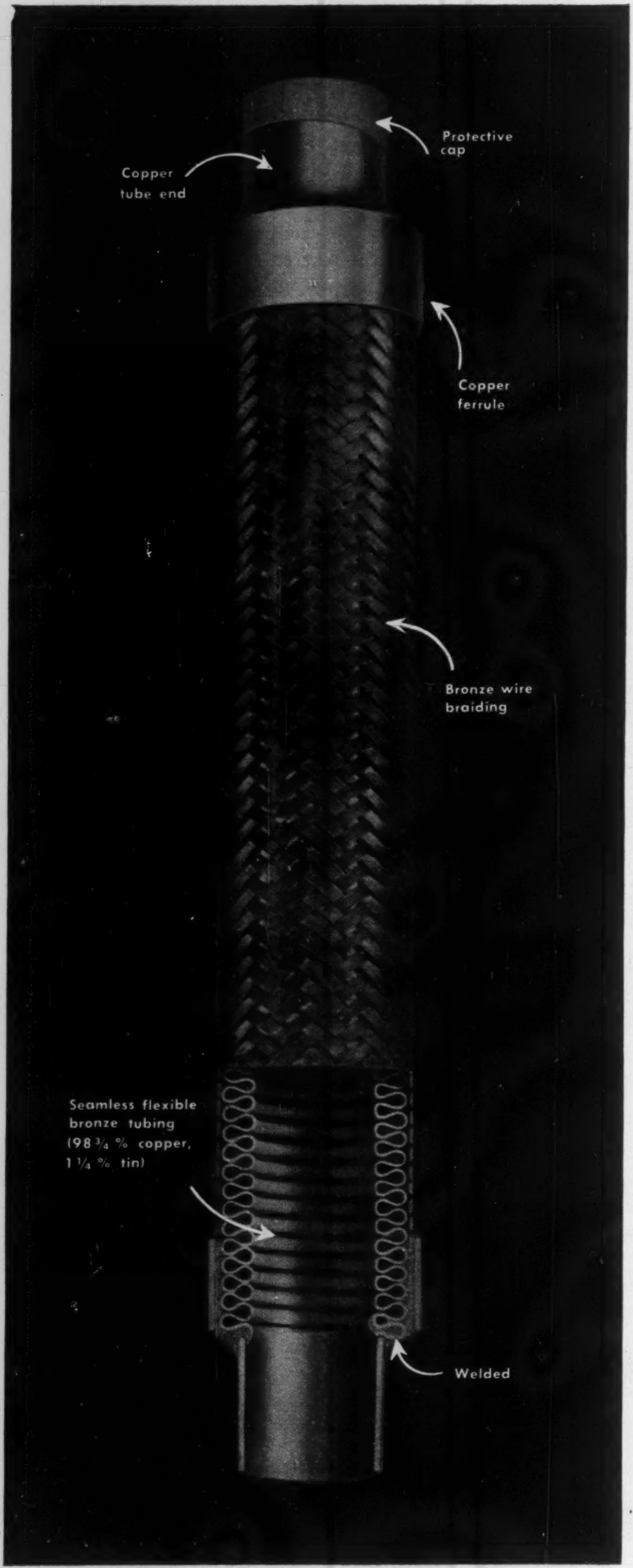
171 MORTIMER STREET BUFFALO, NEW YORK

Publishers of "Fan Engineering" Handbook

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Sales Representatives in all Principal Cities

ENTILATING PRESSURE BLOWING AIR CLEANING COOLING AIR TEMPERING HEATING INDUCED DRAFT FORCED DRAFT EXHAUSTING



Quick, sure way to keep compressor vibration under control

Unchecked vibration in pipe lines of refrigeration and air conditioning units may result in objectionable noise – tubing failure – refrigerant loss. Result: maintenance costs climb, customers complain.

Here's an easy, inexpensive solution: simply install an American Vibration Eliminator.

These flexible seamless bronze tubes allow for expansion and contraction in the rigid lines. They absorb and dampen vibration. They muffle noise. They guard refrigerant lines against fatigue-cracking. And they are as leakproof as the piping itself . . . convey costly refrigerants safely. Upkeep is reduced to a minimum.

American Vibration Eliminators are stocked by leading wholesalers. They come in standard copper tube sizes. For more information, write for Bulletin VE-310R to: *The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Co., Ltd.* 54226

WHEREVER CONNECTORS MUST MOVE

AMERICAN

flexible metal hose and tubing

an ANACONDA® product

AMERICAN VIBRATION ELIMINATORS are built to last. Wire braid cover gives added strength and durability. Ends are sealed with protective cap to prevent contamination prior to installation.

How Servel Water Chillers
Solve your Cooling Problem

1

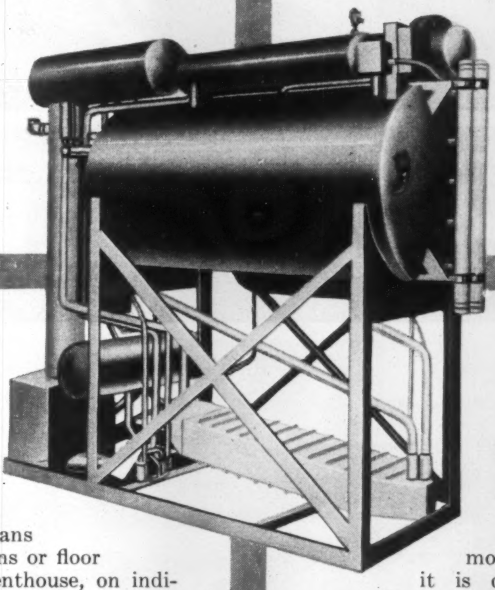
Regardless of cooling needs

The adaptable Servel 25-ton Water Chiller uses water as the refrigerant—provides economical cooling for *air conditioning, process cooling,* or *industrial pre-cooling.* Your Servel dealer can show you performance figures on applications most similar to your needs, in any of the three fields.

2

With the most economical fuel

Steam from the most economical source—gas, oil, LP gas, even *waste* heat—operates the unit, by Servel's exclusive, no-moving-parts *absorption* principle of refrigeration. This wide choice assures you of low operating costs . . . as does Servel's high operating efficiency.



3

Under every installation situation

Light floor loading and vibrationless operation means that no special foundations or floor braces are needed—in penthouse, on individual floors, or in basement. Simple piping, instead of expensive duct work, cuts installation time and costs. Zone control is unusually easy.

4

With exclusive assurance of satisfaction

The Servel Water Chiller cooling system has no moving parts to wear, thus it is quiet and vibration-free. Every Servel Water Chiller is backed by a 5-year warranty. See your Servel dealer or mail coupon for information and engineering co-operation.

MAIL NOW FOR COMPLETE DETAILS!

Servel

the name to watch for great advances in

AIR CONDITIONING ✓ REFRIGERATION

SERVEL, INC., Dept. HP-34 Evansville 20, Indiana

Please send me complete information on Servel equipment for ☐ Air Conditioning, ☐ Process Cooling, ☐ Industrial Precooling.

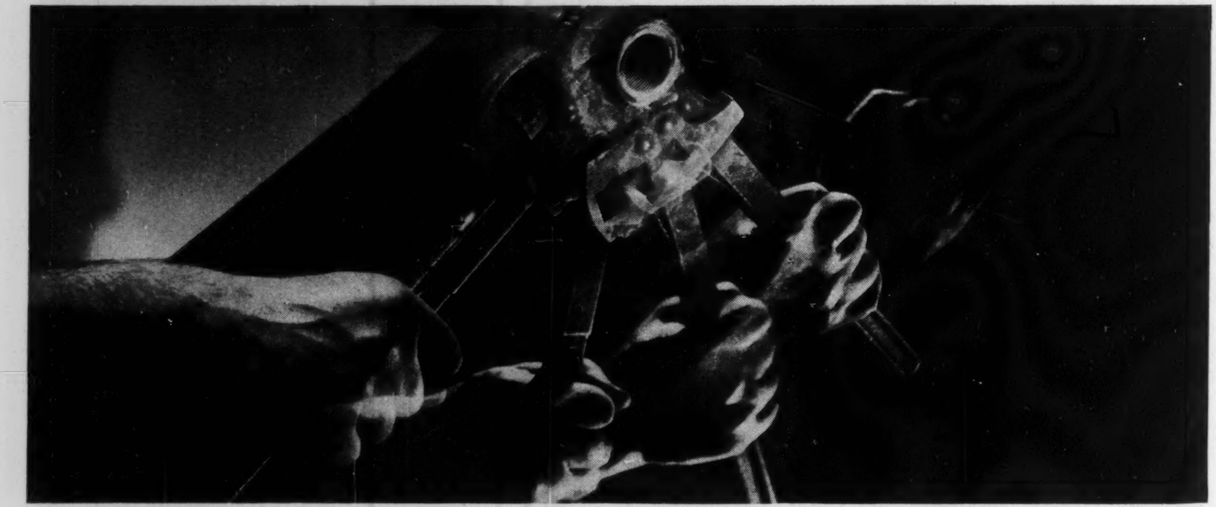
Name____________________

Firm____________________

Address____________________

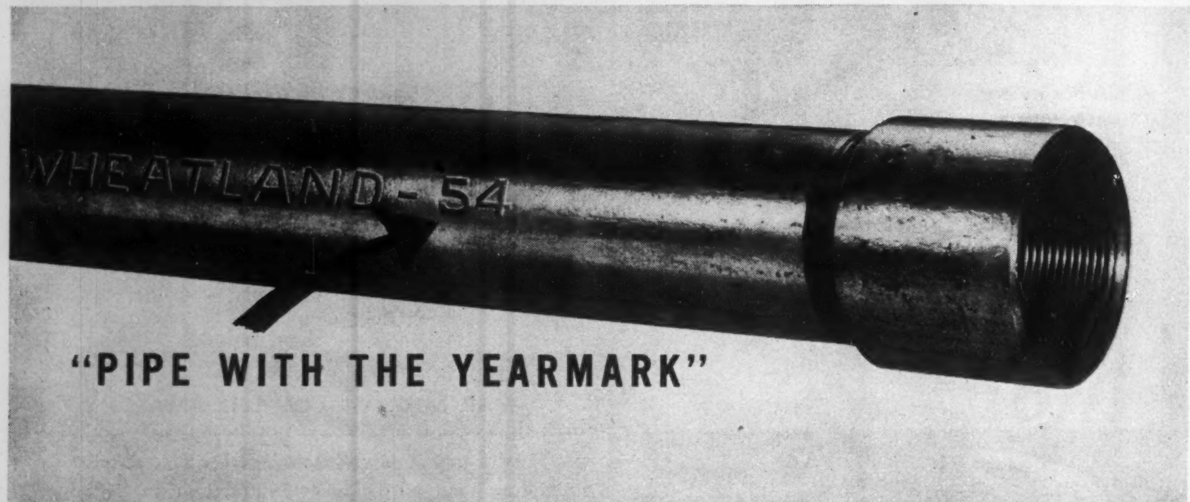
City__________ County__________ State__________

DEPENDABLE



For built-in endurance, thorough inspection, clean finish and prompt delivery make your next order

WHEATLAND

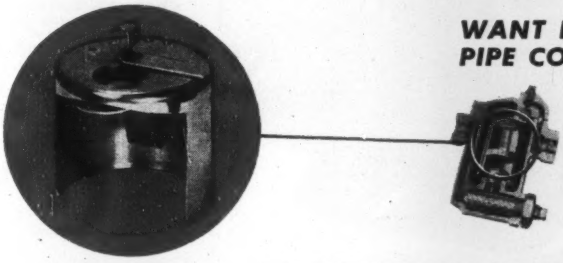


"PIPE WITH THE YEARMARK"

STEEL PIPE

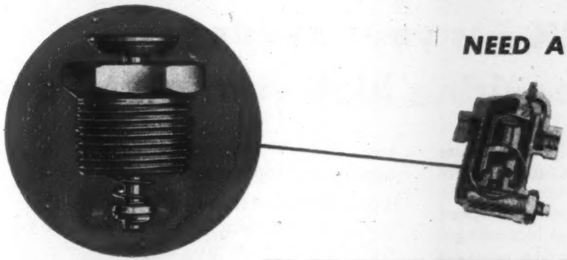
Bankers Securities Building Juniper & Walnut Sts., Philadelphia 7, Penna.

Here's a *Real* STEAM TRAP PACKAGE



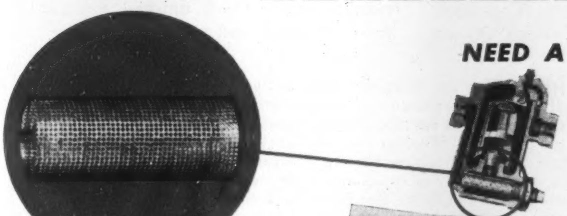
WANT FAST HEAT-UP OF OFF-AND-ON PIPE COILS, HEADERS, UNIT HEATERS, ETC.?

Speed heat-up with Armstrong thermic bucket traps. When steam is first turned on, air is pushed out the large thermic vent—fast! As soon as steam reaches the trap a thermic strip closes the vent, then the bucket functions as a regular bucket. Traps with thermic vent buckets discharge air 50 to 100 times faster than other traps.



NEED A CHECK VALVE AHEAD OF TRAP?

Just specify Armstrong with internal check valve. No check valve installation labor or fittings needed. Spring loaded action and vertical position minimize danger of dirt holding valve open. The Armstrong internal check valve is top quality—long lasting.



NEED A STRAINER AHEAD OF TRAP?

Save money with Armstrong built-in strainer traps. They cost less than a separate trap and strainer and save installation time and money. Stainless steel screen lasts a long time.

Get the full facts about all Armstrong traps. Send today for free Catalog J, The Armstrong Steam Trap Book.

ARMSTRONG STEAM TRAP BOOK

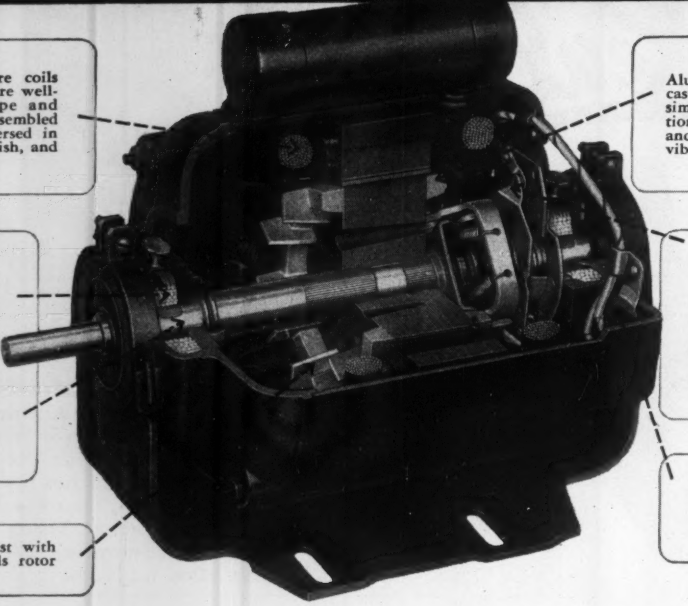
ARMSTRONG MACHINE WORKS
874 Maple Street • Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

Wagner®
ELECTRIC MOTORS
...the choice of leaders in industry

for a Capacitor-Start Motor worthy of your product...

choose the Wagner *Type RK*



Formvar-covered wire coils are prewound to assure well-balanced rigid shape and accurate fit in slots. Assembled stator is dried, immersed in heavy insulating varnish, and baked.

Aluminum squirrel-cage rotor, cast under heavy pressure, is simple and sturdy in construction and is dynamically balanced to insure freedom from vibration.

Long strand wool yarn furnishes a constant supply of filtered oil to the bearing.

Tin babbitt-lined bearings stand heavy pressures with low temperature rise, have excellent anti-seizure properties and are corrosion resistant.

Here's the exclusive Wagner quick-break switch that disconnects the starting winding and capacitor from the line when the motor approaches operating speed. It will operate well over a million times without trouble.

Built-in thermal protection for motors of 1 hp and less.

Blower, integrally cast with rotor, effectively cools rotor and stator.

Type RK fits your needs for applications requiring high starting torque

Wagner capacitor-start induction motors are a sound choice for applications where starting loads are fairly heavy, but which can be brought up to operating speed quickly. They have become increasingly popular for installation on equipment such as air conditioners, refrigerators, freezers, water pumps, motor-driven tools, and on similar fractional or integral horsepower applications.

These motors offer low maintenance cost—only a minimum of servicing is required—and they give many years of reliable service with unusual freedom from vibration and noise.

* * *

When you standardize on Wagner Motors—you get the advantages of a liberal warranty... of nationwide service facilities, with on-the-spot service, replacement motors and parts available from 25 Wagner-owned Service Branches and more than 750 Authorized Service Stations. You can choose from a wide variety of types and sizes—single-phase or polyphase—(from 1/125 to 400 hp). Bulletin MU-185 gives complete information—write for your copy.

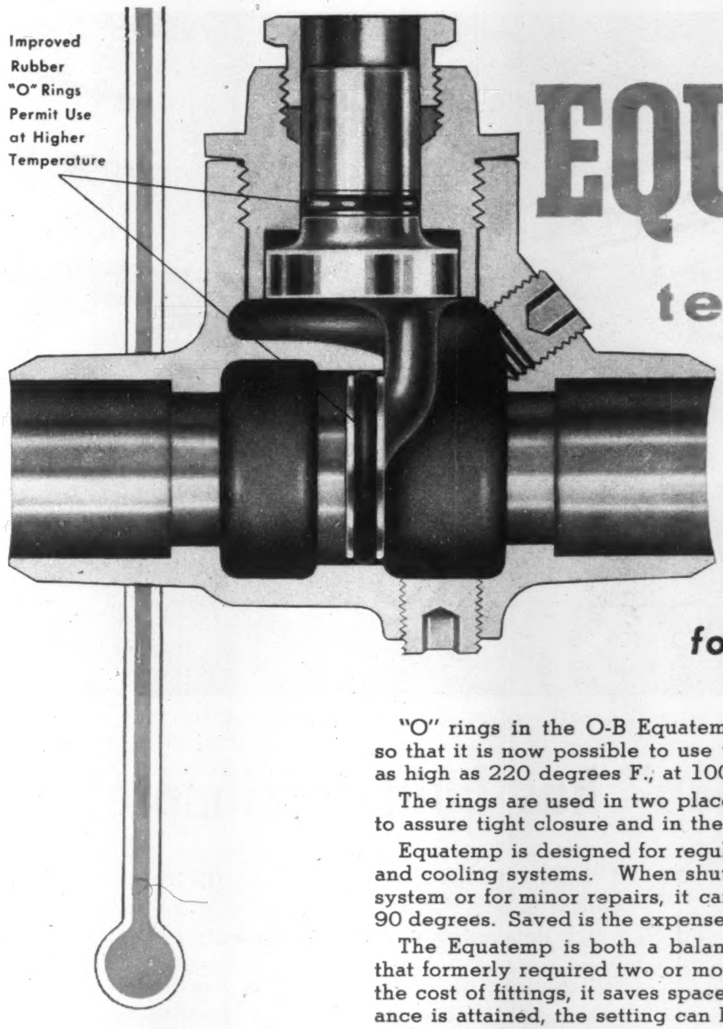
Wagner Electric Corporation
EST. WEC 1891

WAGNER ELECTRIC CORPORATION
6370 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

M54-4



EQUATEMP®

temperature raised to 220° F.

Increase applications for O-B Balancing Valve

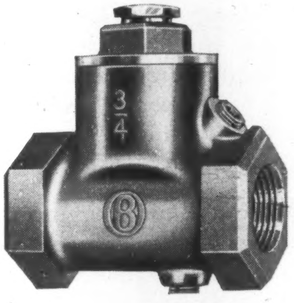
"O" rings in the O-B Equatemp Balancing Valve have been improved so that it is now possible to use the valves on heating systems operating as high as 220 degrees F., at 100 pounds gage pressure.

The rings are used in two places in the valve, in the butterfly type disc to assure tight closure and in the stem to prevent leakage.

Equatemp is designed for regulating water flow in the piping of heating and cooling systems. When shutoff is needed for purging or draining the system or for minor repairs, it can be closed merely by turning the stem 90 degrees. Saved is the expense of draining and refilling the entire system.

The Equatemp is both a balancing and a shutoff valve. It does a job that formerly required two or more valves and fittings. Besides reducing the cost of fittings, it saves space and installation time. Once proper balance is attained, the setting can be locked by tightening the packing nut at the top of the stem.

For additional information, call your Ohio Brass distributor or send the coupon below for Folder 1297-V which describes the O-B Equatemp and its many applications in heating and cooling systems.



Ohio Brass

MANSFIELD OB OHIO, U. S. A.

TYPES AND SIZES

The No. 37 solder-type Equatemp for tubing installations can be furnished in ⅜, ½ and ¾-inch sizes. The No. 38 Equatemp, with threaded pipe ends, is available in ½, ¾, 1, 1¼ and 1½-inch sizes.

TYPICAL APPLICATIONS IN HEATING AND AIR CONDITIONING

Floor
Ceiling
Baseboard
Panel
Unit Heaters
Convector
Unit Air Conditioners

OHIO BRASS COMPANY
Mansfield, Ohio

Please Send me the new Equatemp folder, 1297-V.

Name ______________________________

Company ______________________________

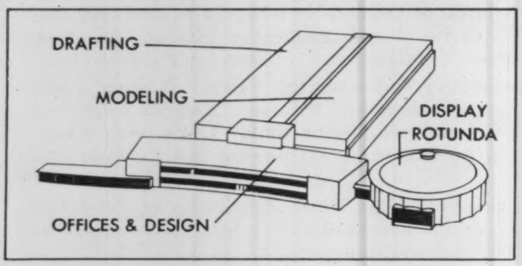
Street ______________________________

City ____________________ **State** ______________

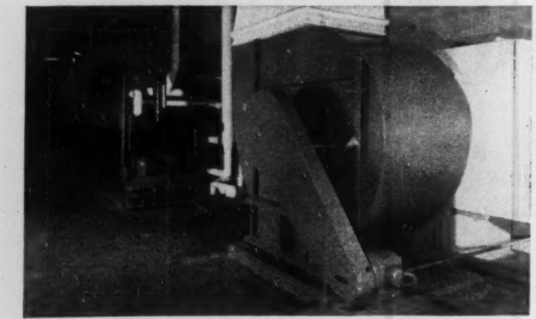
4461-V

Advanced Styling Section of Ford Motor Company's new $11.5 million Styling Building, Dearborn, Michigan.

Ford "dream shop" has built-in climate!



The design-office wing and display rotunda are served by a central system. It includes: 7 supply fans; 34 exhaust fans; heating and cooling coils and sprayed-coil dehumidifiers — all furnished by American Blower.



Air for drafting rooms and modeling studios is conditioned by 24 specially built, automatically controlled American Blower Air-Conditioning Units. Each unit contains heating and cooling coils and capillary air washers.

This "dream shop" at the Ford Engineering Staff's Advanced Styling Section is just one of many styling areas which depend on clean, conditioned air.

For example, in 12 roomy studios clay-modeling teams work under lights which produce shadowless illumination — and intense heat! To absorb this heat and provide the proper climate for working with clay models, specially designed air-conditioning systems were installed for each studio and drafting room. American Blower Air Handling and Air-Conditioning Equipment was used for this unusual assignment.

The expert know-how of American Blower engineers is on tap for industry at all times. If you have an air-handling or air-conditioning problem, phone your nearest American Blower or Canadian Sirocco Branch Office.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry:
AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

SAVE PURCHASING MANHOURS... USE Your Distributor

When you put your Tube Turns' Distributor on your buying team, you can consolidate many orders into one . . . saving you valuable time. Your Tube Turns' Distributor assumes the responsibility of dealing with many manufacturers' salesmen and expediting and following through your orders.

Tube Turns' Distributors and Tube Turns are a service-minded team. Call your nearby Tube Turns' Distributor to save your purchasing time, to simplify your bookkeeping, and to obtain leading brands . . . brands that have got to be good.

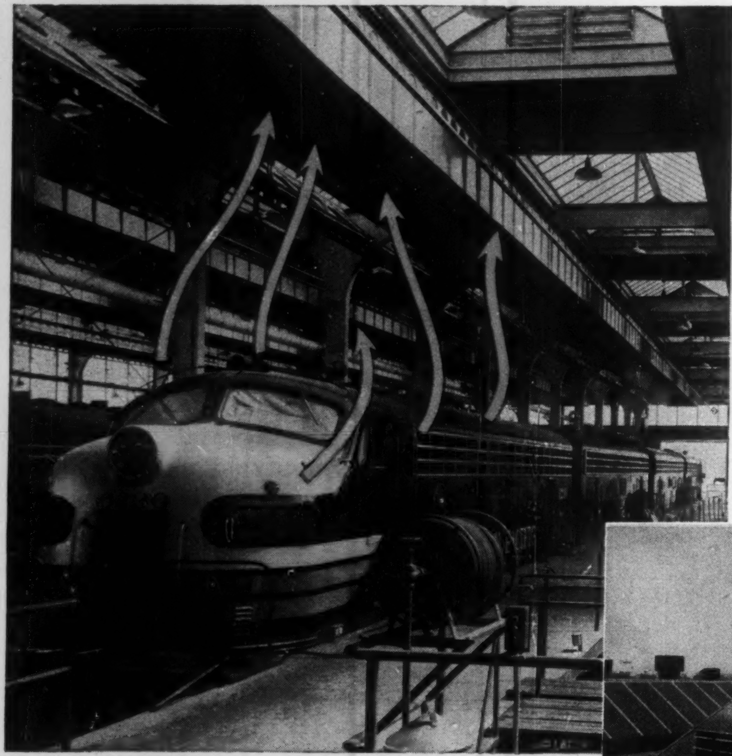
PURCHASING
tt
TUBE-TURN

The Leading Manufacturer of Welding Fittings and Flanges

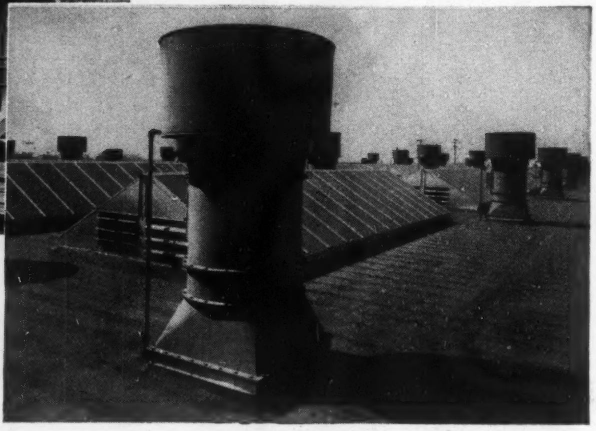
TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Toledo • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas



DEODORIZING DIESELS



HOW SOUTHERN PACIFIC VENTILATED ITS ROSEVILLE ROUNDHOUSE WITH JOY AXIVANE® FANS

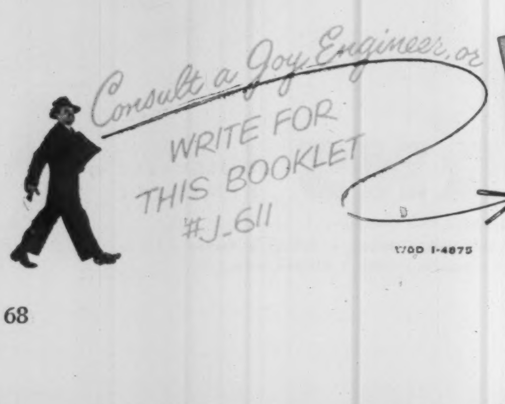
When in need of servicing, the diesel locomotives of Southern Pacific are driven into the roundhouse and parked under long ceiling hoods. As the engines are raced or idled, the customary fumes are emitted from the exhaust. BUT, you have to sniff hard to catch even a faint whiff of diesel fumes in the roundhouse!

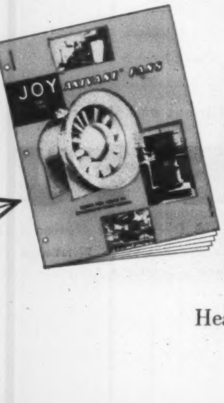
HOW'S IT DONE? By Joy Axivane Fans, of course. Thirty-six fans are hidden in the ceiling hoods. The exhaust gases are hustled out—at the rate of 726,000 CFM—before they can contaminate the surrounding air.

TOPS IN EFFICIENCY. Six 1½ HP models handle 11,000 CFM each, while thirty 5 HP models handle 22,000 CFM each. The fans are actually located right in the exhaust ducts—not an inch of valuable room space is sacrificed!

HIGH-TEMPERATURE PROBLEM, TOO. The air being exhausted sometimes reaches a temperature of 280° F., but temperature variations have little effect on these fans. The vaneaxial design, with adjustable blades, packs plenty of punch—under all conditions. The in-line construction and in-the-duct installation . . . possible only with this type of fan . . . make for real space savings.

136 MODELS. The Joy Axivane Fan line is a wide one. Capacities range up to 200,000 CFM and pressures top 11″ wg. Some models will nestle in the palm of your hand while others would dwarf your home. Want the whole story? Write for our Bulletin J-611, TODAY. **Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.,** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*


Consult a Joy Engineer, or
WRITE FOR THIS BOOKLET #J-611



W&D I-4875

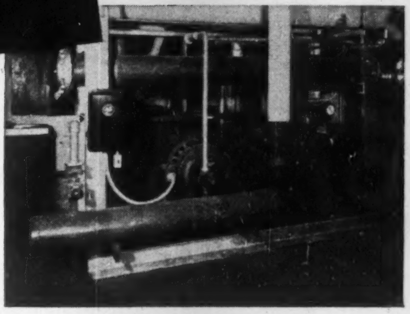
JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

Hollywood Beach Hotel

Acme DRY-EX® *helps Hollywood Beach Hotel play cool host*

SUPERVISOR — Lyle Kopenhaver



To give their guests the comfort they deserve, the Hollywood Beach Hotel in Hollywood, Florida has been healthfully air-conditioned. The heart of the big cooling system is an Acme Dry-Ex Water Chiller furnishing 46 degree water.

The Acme Dry-Ex was selected by Mr. L. H. Stoll of the Hill York Corp. in Miami, Florida. As Hill York's chief engineer he was well acquainted with all types of chillers, but chose the Acme unit because of its complete dependability.

That's the story on all Acme equipment. It's durable, it's economical—but above all else it's dependable. Check with Acme when you start selecting your next air conditioning system.

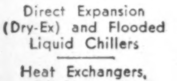
ACME
AIR CONDITIONING
REFRIGERATION

ACME INDUSTRIES, INC.

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

JACKSON, MICHIGAN

Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers



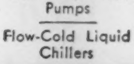
Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators

Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils

Packaged Liquid Chillers to 225 tons



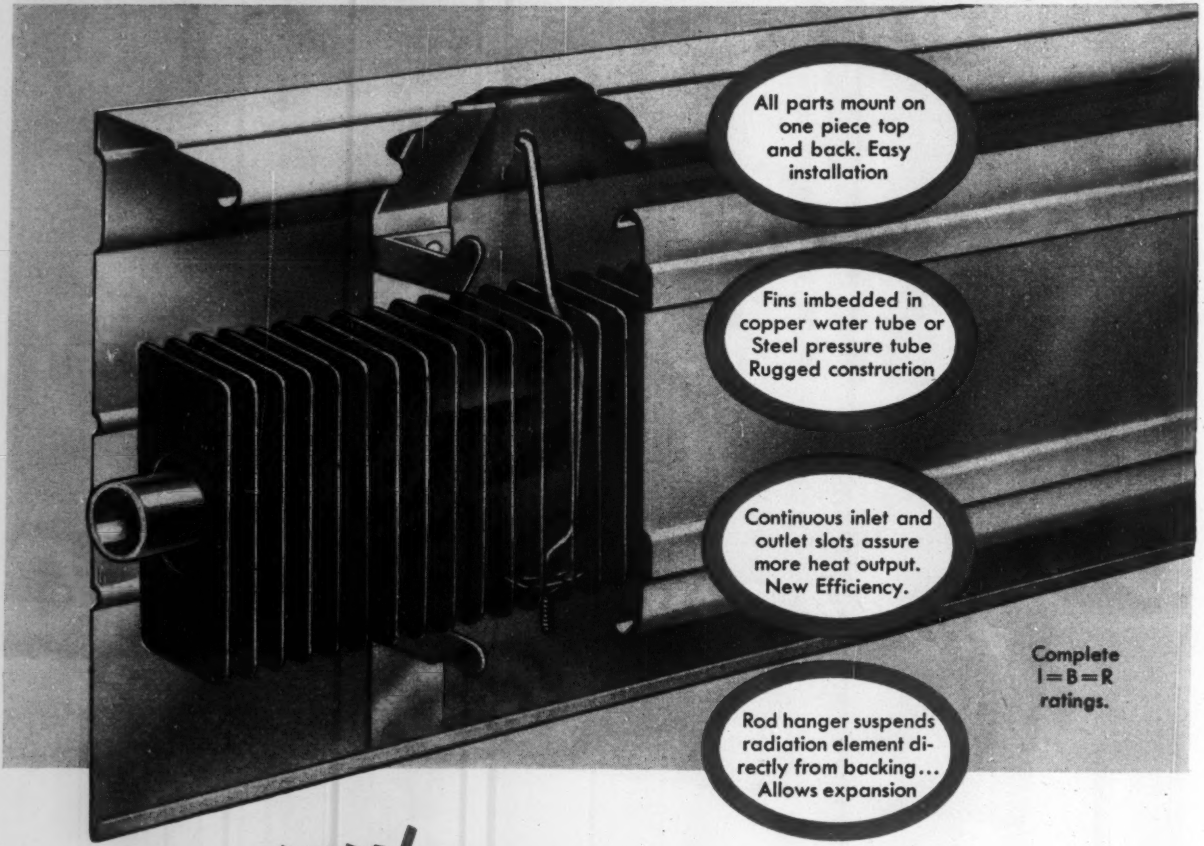
Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers

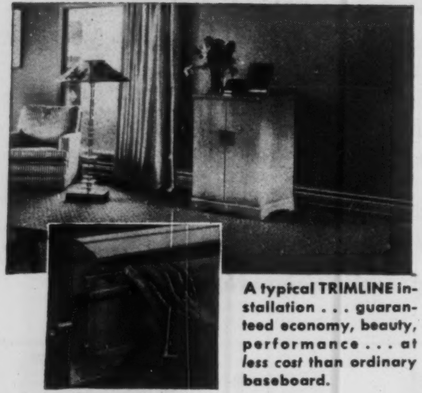
Remote Room Conditioner

Continuously serving the air conditioning and refrigeration industry since 1919

HERE'S **Visible Baseboard Value** *for any home*


All parts mount on one piece top and back. Easy installation
Fins imbedded in copper water tube or Steel pressure tube Rugged construction
Continuous inlet and outlet slots assure more heat output. New Efficiency.
Complete I=B=R ratings.
Rod hanger suspends radiation element directly from backing... Allows expansion

VULCAN'S NEW TRIMLINE *Radi-Vector**



A typical TRIMLINE installation . . . guaranteed economy, beauty, performance . . . at less cost than ordinary baseboard.

Cover snaps on bracket. Easily removed for cleaning.

For Enduring Beauty . . . Lifetime Comfort

Vulcan TRIMLINE radiation is ideal for ANY HOME . . . modern or traditional. Made right to fit right, TRIMLINE is flexible in application for virtually any type of floor plan.

TRIMLINE combines the two most popular types of heat . . . Radiant Heat for floor level comfort . . . Convection Heat for even distribution of warm air throughout the "comfort zone". Floor to ceiling difference is only 3 degrees. LOW COST installation assured because TRIMLINE requires fewer joints, less fittings and accessories. Dampers may be installed anywhere, any time . . . on the job. Baseboard enclosure can be ordered to length with necessary end enclosures, corner pieces, and joining pieces, for easy fitting to exact dimensions. Accessories can be made with any desired angle to fit bay window installations. In the "long run" Vulcan costs LESS!

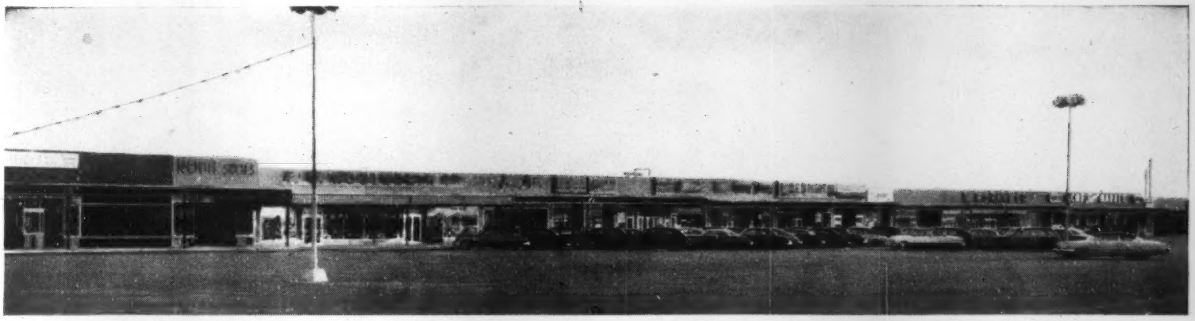
Also made in Canada under trade name of Heal Radiation by Vapor Car Heating of Montreal Representatives in Principal Cities. Over 28 years a leader in fin-tube radiation.

VULCAN

The VULCAN RADIATOR CO.
26 Francis Avenue, Hartford, Connecticut

Write for TRIMLINE Catalog No. 54

*** Trade-mark Reg.**



MAGIC CITY SHOPPING CENTER in Barberton, Ohio, has over three dozen retail stores plus doctor's and dentist's offices, bank, bowling alley. Many use a heating unit in conjunction with G-E Cooling to provide year-round comfort.

SOLVED: 5 Major Problems in Air Conditioning a Shopping Center

In new $3,500,000 Ohio shopping center, the air conditioning contractor reports that G-E Packaged Air Conditioners saved money, saved space, reduced installation time, cut maintenance... provided amazing flexibility to fit *any* job, *any* situation.

SAVED $10,000 IN ONE APPLICATION.
In one of the largest stores, the contractor reports that installation of G-E Packages made possible savings of about $10,000 compared to the estimate for a conventional central system. Yet these units are operating as a central system with ductwork!

REDUCED INSTALLATION TIME BY 30%.
In both in-space and out-of-space applications, G-E units help cut estimated installation time by almost a third. Savings can be even greater for air conditioning an existing structure!

SAVED VALUABLE FLOOR SPACE.
Builder reports that, in many installations, the application of compact G-E Packaged Air Conditioners increased useful floor area. Some store owners feel G-E units pay for themselves in this way alone!

35% CUT IN ESTIMATED MAINTENANCE COSTS.
No refrigeration lines, seals to check, no motor lubrication needed. Installing contractor Max Weisbrod, of Refrigeration Distributing Co., Inc., of Canton, Ohio, figures savings of at least 35% in upkeep.

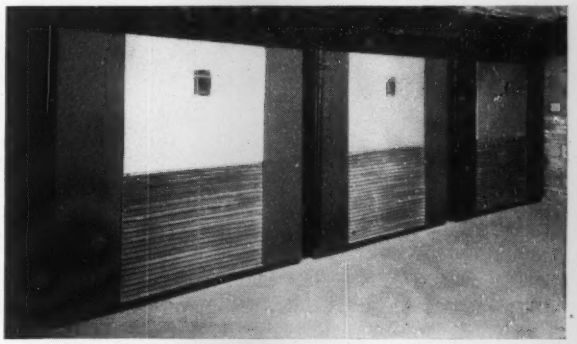
FIT EVERY APPLICATION.
Units are used in-space, out-of-space, on the selling floor, in the basement, in the storeroom, in large stores, small stores, with and without heating units and cooling towers. They range in capacity from 3 to 15 tons with a total of about 450 tons of G-E Cooling in the entire project.

G-E 5-year Warranty big factor in the equipment selection. Factory-sealed and tested, G. E.'s sealed-in-steel cooling unit is so trouble-free that G. E. provides 5 years' protection on the entire refrigeration cycle.

To find out how you can use G-E units profitably, call your G-E dealer today or write to General Electric Company, Commercial Products Department, Sec. HPC-1, Air Conditioning Division, Bloomfield, N. J.

MR. RUSSEL POLAK, who conceived and built this center, says: "We selected General Electric Packaged Air Conditioners because of the large savings gained. Also, the diversity of placement made packaged units more practical for us."

F. W. WOOLWORTH store uses five 7½-ton G-E units in-space for flexibility in placement, absence of ductwork and ease in zone control adjustment.



W. T. GRANT uses three 15-ton units and one 10-ton unit as a central system in the mezzanine with another 15-ton unit in the basement.

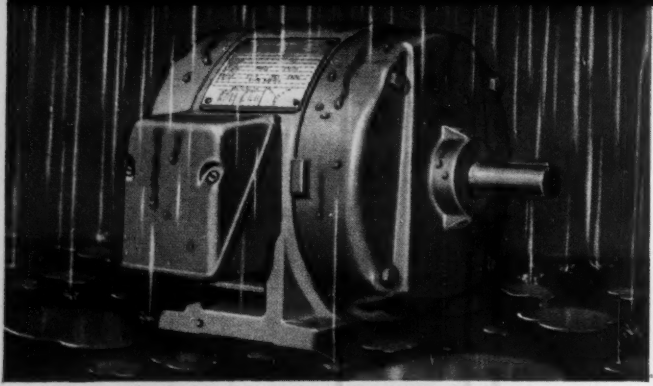
Packaged AIR CONDITIONERS

for business and industry

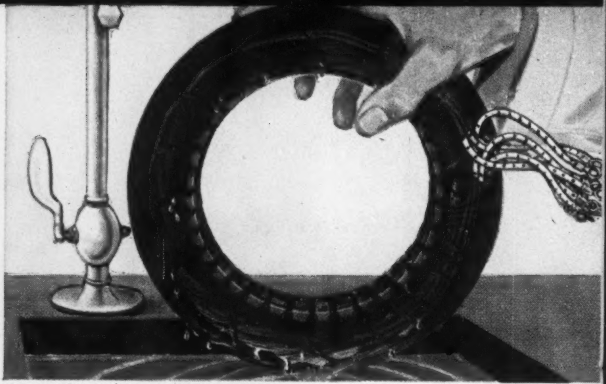
GENERAL ELECTRIC

GENERAL ELECTRIC
TRI-CLAD INDUCTION MOTOR

YOU GET EVEN LONGER MOTOR LIFE



PHYSICAL PROTECTION INCREASED 60 PER-CENT by a complete redesign of cast-iron frame and end shields. This motor is suitable for many jobs where ordinary dripproof motors should not be applied.



EXTRA ELECTRICAL STRENGTH is assured by use of new polyester film insulation. A silicone coating, Dri-film,* virtually eliminates stator insulation failure caused by moisture.

*REG. U.S. PAT. OFF.

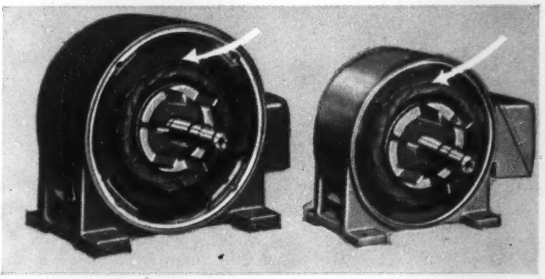
TRI 55 CLAD THE LEADER IN MODERN MOTOR DESIGN

REG. U.S. PAT. OFF.

GENERAL ELECTRIC ANNOUNCES...

THE ALL-NEW TRI 55 CLAD MOTOR

REG. U.S. PAT. OFF.



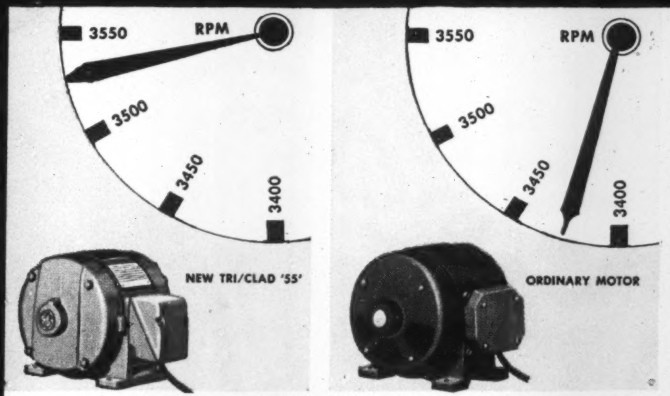
LIGHTER, SMALLER Tri/Clad '55' motors have been made possible through better use of space within the frame. Active materials (magnetic steel, copper) have not been sacrificed.

Complete Line of Dripproof, Enclosed Motors and Gear-Motors Available in Most Ratings in 1954

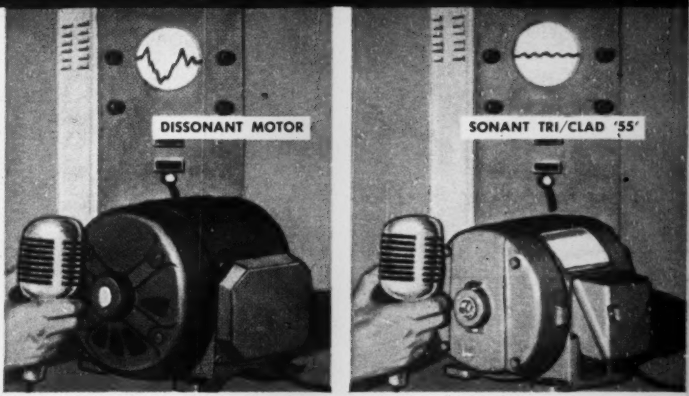
Here's the all-new Tri/Clad '55' motor — now available in NEMA 182 and 184 frame sizes.

You can get complete information on this dramatic motor achievement by writing for bulletin GEA-6013 on Tri/Clad '55' Dripproof motors, GEA-6012 on Tri/Clad '55' Enclosed motors, or GEA-6027 on Tri/Clad '55' Gear-motors, or by contacting your nearby G-E Apparatus Sales Office or G-E Motor Agent. General Electric Company, Section 648-1, Schenectady 5, N. Y.

YOU GET EVEN BETTER PERFORMANCE



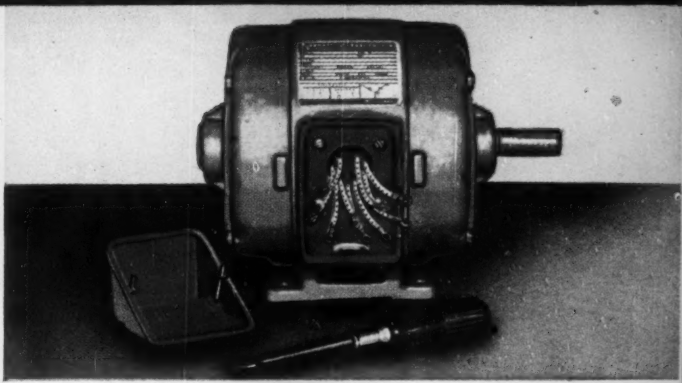
HIGHER FULL-LOAD SPEEDS is only one of many improved characteristics of this new G.E. motor. Above shows comparison of an ordinary motor with the Tri/Clad '55' — both rated at 3600 rpm.



SONANT OPERATION of the new Tri/Clad '55' motor has been laboratory tested and proven. Motor operates at reduced noise level, and operating sound is pitched to a more pleasant frequency.

YOU GET EVEN MORE INSTALLATION AND MAINTENANCE SAVINGS

NEW BEARING SYSTEM allows this motor to run longer than other motors without regreasing. One reason—greatly improved synthesized grease with 8 times the mechanical stability of ordinary grease.



EASIER TO SERVICE, the new Tri/Clad '55' has larger conduit box diagonally split for simplified wiring. Perma-numbered leads mean that even clipped and stripped wires are instantly identified.

Progress is our most important product

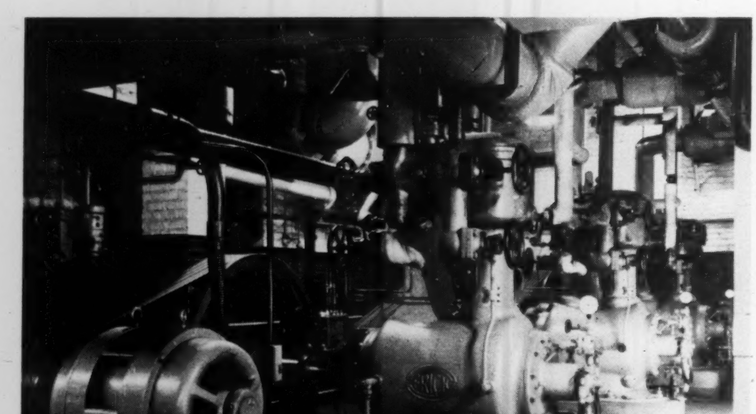
GENERAL ELECTRIC

Hotel William Penn, Pittsburgh, Is Served Five Ways by —

TRADE FRICK MARK®

Refrigeration

These include air conditioning, cooling drinking water, refrigeration of foods, freezer service, and making ice. This magnificent hotel has used Frick equipment since 1936, and finds it both efficient and dependable. Three of the four Frick compressors are shown.



The buildings in which you are interested can likewise profit by using Frick Equipment. We make air conditioning units and central systems; compressors handling Freon-12, ammonia, and other refrigerants; condensers, coolers, coils; freezers, ice makers, ice reserve units; piping, valves, fittings, controls, and special equipment.

Good territories still available for dealers.

Write, wire, or phone.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK Co.
WAYNESBORO, PENNA. U.S.A.

"Let's be sure they're listed for all 3"

"Check your records, Miss Webster, to be certain we have Wolverine listed as a supplier of copper, aluminum, and electric-welded steel tubing.

"That gives us a single source for the three kinds of tubing we use here. Oh, yes, make a note that Wolverine can supply us with technical help. They tell me up in engineering that Wolverine has smoothed out some rough spots for them on the last job."

It's in the cards: Make sure that Wolverine is in your files as a one-source supplier of copper, aluminum or electric-welded steel tubing. And make sure that you address your company's technical problems to Wolverine's Field Engineering Service.

If you want capsulized, helpful information—send for Wolverine's handy Statement of Scope. It tells at a glance what Wolverine can do for you.

And make sure you give this memo to your secretary today—WOLVERINE TUBE DIVISION, of Calumet & Hecla, Inc., 1461 Central Ave., Detroit 9, Michigan.

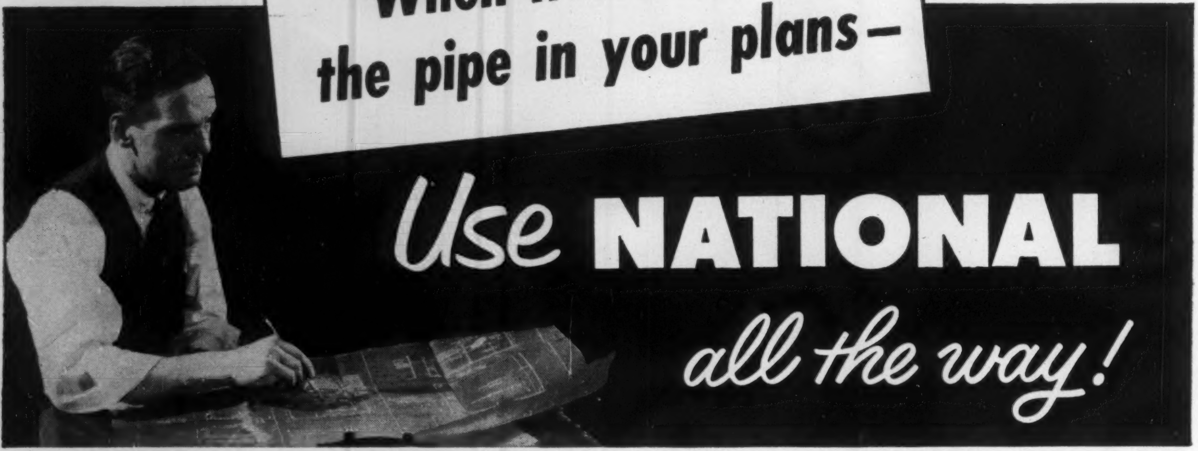
MEMO: *"Make sure that Wolverine is listed for all 3—tubing of copper, copper base alloys, aluminum and electric-welded steel."*

EST 1916

WOLVERINE TUBE DIVISION
OF CALUMET & HECLA, INC.
Manufacturers of Quality-Controlled Tubing

PLANTS IN DETROIT, MICHIGAN, AND DECATUR, ALABAMA. • Sales Offices in Principal Cities
Export Dept., 13 E. 40th St., New York 16, N.Y.

When it comes to the pipe in your plans—



Use NATIONAL all the way!

WHETHER you are installing a conventional hot water or steam heating system, fire control and plumbing lines, a modern radiant heating application or pipe for a snow melting system, remember that NATIONAL, the world's most widely used pipe, has all the necessary qualities for complete adaptability in all these services. This means to you—no worries, no doubts, no uncertainties. The choice of NATIONAL Pipe relieves you of any and all further checks or investigations. It's as easy and as simple as that.

Why? Well, "old timers" will tell you that confidence in NATIONAL to fill the bill is born of years of experience and observation, upon thousands and thousands of installations in structures of all kinds. But most important of all, it is based on the comforting knowledge of NATIONAL's uniform, dependable, trouble-free performance, the kind of performance that you can feel proud to pass on to your customers.

For over three quarters of a century, each new generation of pipe users has looked to NATIONAL with complete confidence to meet all mechanical requirements. They know that while old in name and rich in service records, it is ever new and modern to fit today's requirements. And so, whatever type of service your plans call for, we are sure you will find both satisfaction and profit in standardizing on NATIONAL "all the way."

Here's why *NATIONAL* Pipe gives the most service per dollar cost:

1 *It's Uniform Throughout*—National Pipe is uniform in metallic structure, ductility, strength, corrosion resistance, surface finish and diameter.

2 *Threads and Cuts Easily*—Absence of slag inclusions, laminations and blisters assures smooth, strong threads . . . clean cuts.

3 *Coils and Bends Well*—National Pipe has that extra strength and ductility so necessary to meet the demands of close and exacting fabrication.

4 *Makes Sound Joints*—Uniformity and accuracy in manufacturing have made unequaled pipe jointing records for National Pipe . . . whether welded or threaded.

5 *It's Scale-Free* — National Scale-Free Pipe avoids damage to valve seats and clogging of small orifices.

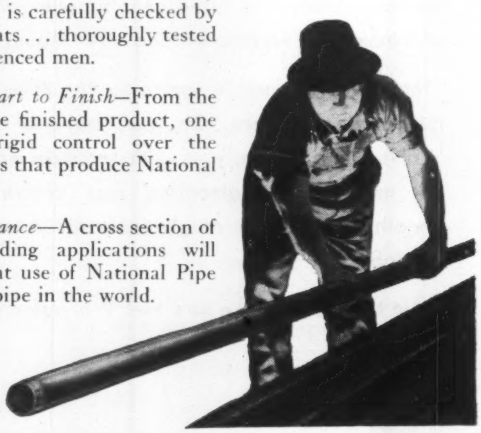
6 *It's Spellerized*—Special rolls work the bloom surface to eliminate irregularities and produce a dense, uniform surface.

7 *Constantly Improved*—For over 60 years, National Steel Pipe has constantly been improved to meet the most difficult requirements.

8 *It's tested and Inspected*—Each and every stage of production is carefully checked by the finest instruments . . . thoroughly tested by the most experienced men.

9 *Controlled from Start to Finish*—From the raw material to the finished product, one organization has rigid control over the manufacturing steps that produce National Steel Pipe.

10 *Nationwide Acceptance*—A cross section of industrial or building applications will show a predominant use of National Pipe . . . largest selling pipe in the world.



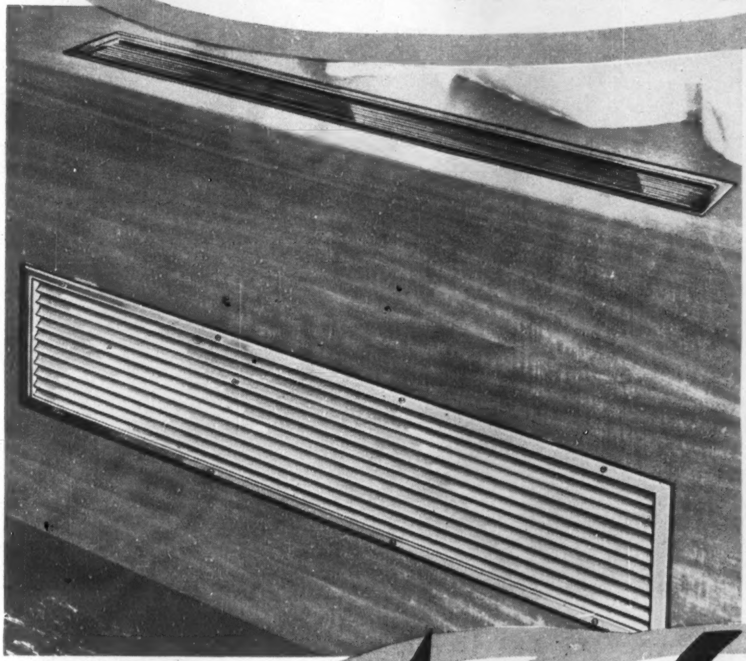
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS • UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S NATIONAL *Steel* PIPE

UNITED STATES STEEL

INSTALL *Custom Designed* CONVECTOR GRILLES

without increasing your building costs



- **EXTRA RUGGED**
  Made to *withstand heaviest use and abuse* which lower wall grilles must take.
- **TAMPER PROOF**
  No "see-thru". Extra-close spacing of louvers prevents gum wrappers—waste paper from being dropped between louvers.
- **EXTRA-HEAVY SUPPORT BARS**
  Heavy-duty steel bars on 6" centers give added strength where it is most needed.
- **MADE TO ANY SIZE**
- **OVER 70% FREE AREA**
- **EASILY INSTALLED**
  Precision built to fit snugly. Can be installed in marble, tile or other special surfaces.
- **EXTRA-WIDE BLADES FOR MOST EFFICIENT DEFLECTION OF AIR**
- **EACH DEFLECTING BLADE "HEMMED" FOR ADDED STRENGTH —ADDED SAFETY**
- **ALSO AVAILABLE WITH DAMPER AND KNOB CONTROL**

Above
Photo shows AIRFOIL convector grilles installed in John Hancock Building.

Architects—
Crame & Ferguson,
Boston, Mass.

Gen. Contractors—
Turner Const Co.,
Boston, Mass.

Heating & Ventilating Engineers—
Buerkel & Co., Inc.,
Boston, Mass.

Sheet Metal Contractors—
Stanley E. Priggen Co.,
Boston, Mass.

AirFoil

AIR CONDITIONING OUTLETS

AIRFOIL CUSTOMED CONVECTOR GRILLES are *built above and beyond average demand. Give air distribution performance that's above and beyond average—YET COST IS KEPT AT STANDARD PRICES.*

Superior construction and performance usually reserved for the highest-priced grilles are incorporated as standardized features of this great new line of convector grilles. *They meet the most exacting specifications of architects and engineers.*

AIRFOIL CONVECTOR GRILLES are better designed—more durable. Feature for feature, dollar for dollar—they cannot be duplicated. Made with a "decorator's touch," *they add new beauty to any installation.*

Free

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

☐ Air conditioning outlets
☐ Return air grilles and registers
☐ Volume controllers
☐ Perforated metal and ornamental grilles
☐ Door ventilators
☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

☐ RUSH information on Convector Grilles.
☐ Send complete catalog.
☐ Send literature on above checked items.

NAME______________________________
ADDRESS____________________________
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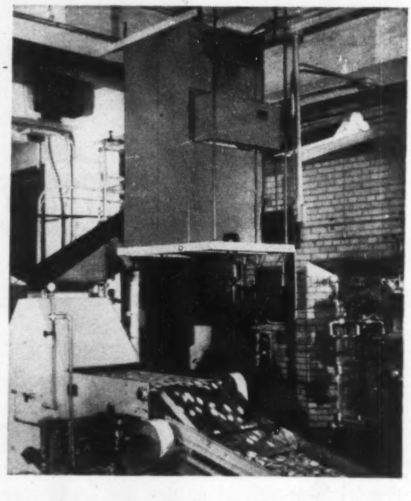
A TASTY BUT DISTRESSING PROBLEM

Felber Biscuit Company in the process of spraying hot cocoanut oil on their delicious Town House crackers, acquired an unwelcome oil mist problem. A fan exhaust system—installed to clear the air—wasted gallons of costly cocoanut oil and created a dangerous fire threat.

How to flavor these famous crackers without oil-painting the entire building? Felber Biscuit did it with an Oil Mist PRECIPITRON!

Excess oil mist is now drawn into a Westinghouse PRECIPITRON and out of the air completely. Result: mist, mess and fire hazard have disappeared. Valuable cocoanut oil is now salvaged for re-use. Employee working conditions are greatly improved.

Perhaps Westinghouse PRECIPITRON can draw savings out of the air for *you*. There is a PRECIPITRON for every application for removing contaminants from the air. For an answer to *your* specific air cleaning problem . . . call your nearest Westinghouse-Sturtevant office today. Or write to Sturtevant Division, Westinghouse Electric Corporation, Hyde Park, Boston 36, Mass.

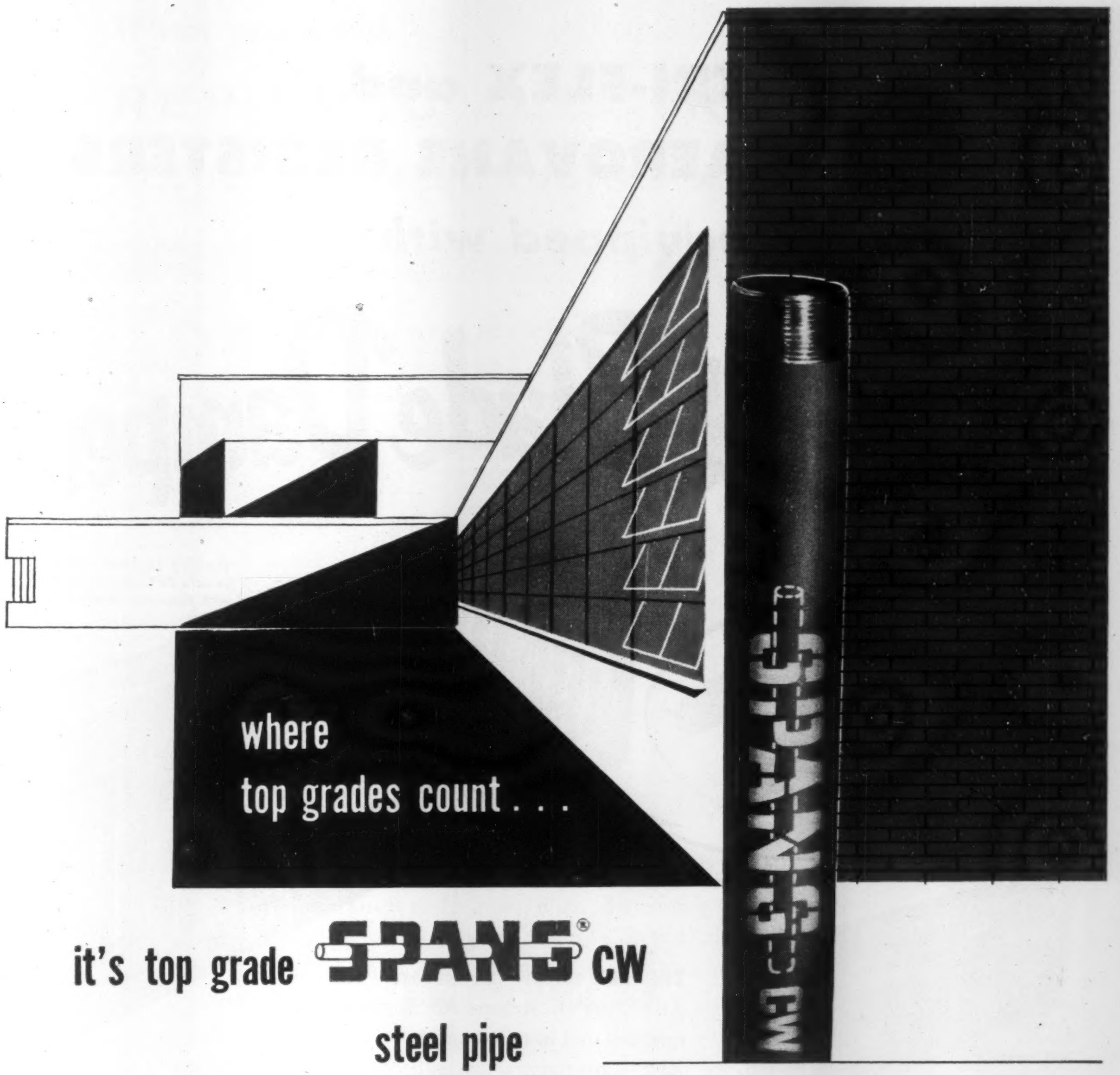


Westinghouse PRECIPITRON suspended directly over the hot cocoanut oil spray collects excess oil mist from the spraying operation. Clean air is returned to the room; valuable oil is reclaimed.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE... IF IT'S **Westinghouse**

J-80332



it's top grade **SPANG**® CW

steel pipe

The children who study at Harper Elementary School, Evansville, Indiana, learn at a young age that in order to achieve the top grade they must put the best they can into their studies.

The men who planned and constructed this modern, well-equipped school also know that in order to build a really top-grade school they must install the best in materials. That's why Spang CW Steel Pipe was used for drainage lines, plumbing, hot and cold water lines, and steam lines from the boilers to the ventilators in this school.

Contractors and builders who are conscientious about top-grade materials specify Spang CW Steel Pipe because it offers these advantages:

1. The manufacture of Spang CW is quality-controlled from the careful selection of top grade skelp . . . through close metallurgical control during forming . . . to the finished product which is *doubly* inspected to assure you of a reliable product made for years of satisfactory service.
2. Spang CW pipe is easier to cut, weld, thread and bend making installation faster and keeping installation costs low.

It pays to get **quality** *when you specify pipe. It will pay you to specify Spang CW Steel Pipe. See your Spang Distributor.*

Owner: School City of Evansville, Indiana
Architect: Ralph Legeman Associates, Evansville, Indiana
Piping Contractor: Newman Brothers Inc., Evansville, Indiana
Spang Distributor: Plumbing & Industrial Supply Co., Evansville, Indiana
General Contractor: Balser Bros. Const. & Supply Co., Evansville, Indiana

SPANG

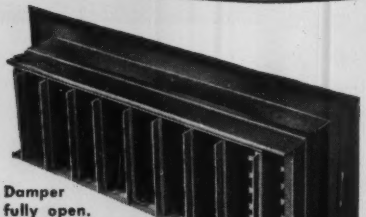
SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Office: Two Gateway Center, Pittsburgh, Pennsylvania. District Sales Offices: Atlanta, Boston, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis.

TRI-FLEX and AEROVANE REGISTERS equipped with

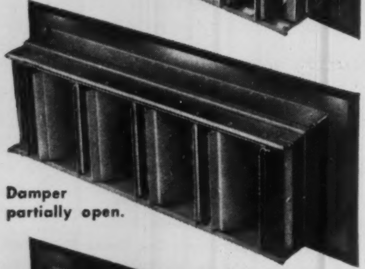
Opposed Blade Dampers

Showing TRI-FLEX T-647 Double Deflection Register with Opposed Blade Damper

KEY OPERATOR FOR OPPOSED BLADE DAMPER
Blades are regulated by key operator which may be removed or tapped permanently into place.



Damper fully open.



Damper partially open.

Damper fully closed.

TRI-FLEX Supply Air Registers and AEROVANE Return Air Registers — specified and installed on important air conditioning jobs — are constructed with opposed blade dampers.

This improved damper unit insures uniform distribution of air over the entire face of the register . . . and provides positive damper setting in any position from fully open to fully closed regardless of system pressure. Set in a rigid steel frame, blades are formed for extra strength and stiffness, and overlap when closed, eliminating any possibility of air leakage. Blades are regulated through the face of the register by means of a key operator which may be removed or tapped permanently into place.

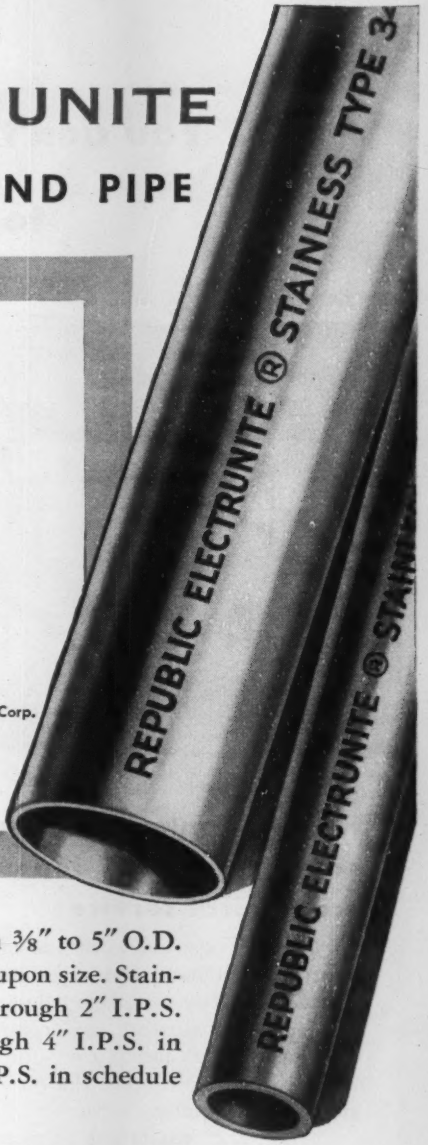
For complete information and size selection data for TRI-FLEX and AEROVANE Registers and Grilles, write for a copy of Catalog No. 200.

TUTTLE & BAILEY INC
NEW BRITAIN, CONNECTICUT

When you need

REPUBLIC ELECTRUNITE

STAINLESS STEEL TUBING AND PIPE


REPUBLIC ELECTRUNITE ® STAINLESS TYPE 3
REPUBLIC ELECTRUNITE ® STAIN

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McGowan-Lyons Hardware & Supply Co., Mobile

CALIFORNIA
Ducommun Metals & Supply Co., Los Angeles
Tayler & Spotswood Co., San Francisco

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Atlantic Steel Co., Atlanta

ILLINOIS
Chicago Tube and Iron Co., Chicago

KENTUCKY
Williams and Co., Inc., Louisville

MARYLAND
The Hill-Chase Steel Co. of Maryland, Baltimore

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American Radiator & Standard Sanitary Corp.
in many leading cities

The Creamery Package Mfg. Co.
(Sanitary applications) in many
leading cities

- Stainless Steel Tubing is electrically welded in 3/8" to 5" O.D. with wall thickness to 25 ga. to 8 ga., depending upon size. Stainless Steel Pipe comes in sizes from 1/8" I.P.S. through 2" I.P.S. in A.S.A. schedule 40S; from 1/8" I.P.S. through 4" I.P.S. in schedule 10S; and from 1/2" I.P.S. through 4" I.P.S. in schedule 5S wall thicknesses.

Both ELECTRUNITE Stainless Steel Tubing and Pipe are stenciled for your positive identification prior to use. No matter where the pipe or tubing are cut, they can still be identified.

REPUBLIC STEEL CORPORATION
Steel and Tubes Division
231 East 131st Street, Cleveland 8, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, New York

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Republic
ELECTRUNITE
STAINLESS STEEL TUBING AND PIPE

You don't have to hide

If you have installed

PETRO

OIL or GAS HEATING

Heating contractors know PETRO equipment gives dependable, economical service

It's a happy occasion when you meet old customers if you have sold them Petro heating. Chances are, they're back to tell you how much they enjoy the comfort and economy of their Petro heating . . . and to give you the names of friends who are prospects. For no other heating gives such outstanding service and fuel economy . . . no other equipment is more simple in construction or trouble-free in service.

Yes, for over 51 years heating and plumbing contractors have found Petro a quality and profitable line to sell. Why not send for complete information?

Petro, 3042 West 106th St., Cleveland 11, Ohio.
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Residential Oil and Gas Burners, Oil and Gas Furnaces and Boilers, Industrial and Commercial Oil, Gas and Oil-Gas Combination Burners

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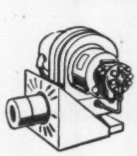
T.M. REG. U.S. PAT. OFF.

OVER 50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT

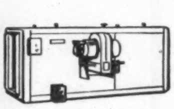
Oil and Gas Furnaces and Boilers

Made in popular sizes to fit heating needs of homes from 4 to 10 rooms. Extremely compact.



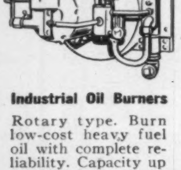
Conversion Oil Burners

Sizes for residential or commercial use. Easily installed on existing furnaces or boilers. Capacities to 20 gallons per hour.



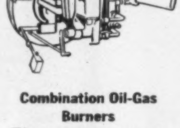
Horizontal Oil Furnace

Hang it or hide it—this winter air conditioner fits anywhere. Available in 5 models from 80,000 to 180,000 Btu's (output at bonnet).



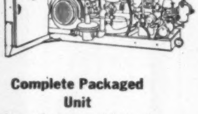
Industrial Oil Burners

Rotary type. Burn low-cost heavy fuel oil with complete reliability. Capacity up to 200 gals. per hour. Fit most any boiler.



Combination Oil-Gas Burners

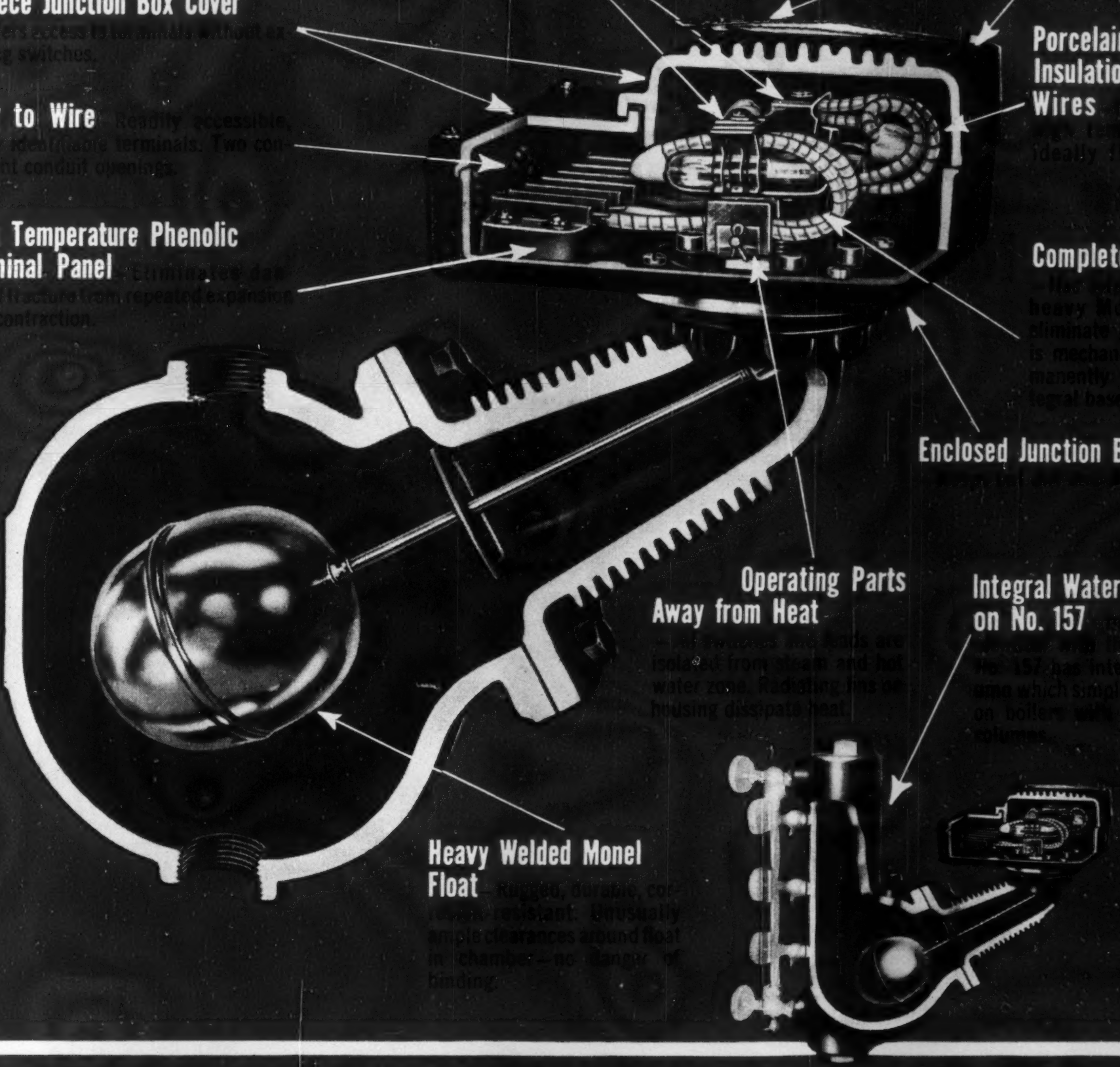
The answer to seasonal fuel shortages and price advantages. Switch fuels in a matter of minutes.



Complete Packaged Unit

For oil, gas, or both. A complete combustion system in which all elements are correctly balanced. Simply bolt on boiler front.

Illustrated is the widely-used McDonnell No. 150 Pump Control, Low Water Cut-off and Alarm Switch, for boilers with operating pressures up to 150 lbs. Like all McDonnell products, the No. 150 is better built for better performance.



Dual Multi-Purpose Switches —For pump control, low water cut-off and alarm. Heavy duty, dependable, Underwriters approved.

Factory Sealed —Main part of cover factory sealed to prevent tampering.

2-Piece Junction Box Cover —Offers access to terminals without exposing switches.

Easy to Wire Readily accessible, easily identifiable terminals. Two convenient conduit openings.

High Temperature Phenolic Terminal Panel —Eliminates danger of fracture from repeated expansion and contraction.

Porcelain Bead Insulation on Lead Wires —Impervious to high temperature, yet ideally flexible.

Completely Packless —Has [illegible] bellows of heavy Monel metal to eliminate binding, which is mechanically and permanently sealed by integral base plate.

Enclosed Junction Box [illegible]

Operating Parts Away from Heat —All switches and leads are isolated from steam and hot water zone. Radiating fins on housing dissipate heat.

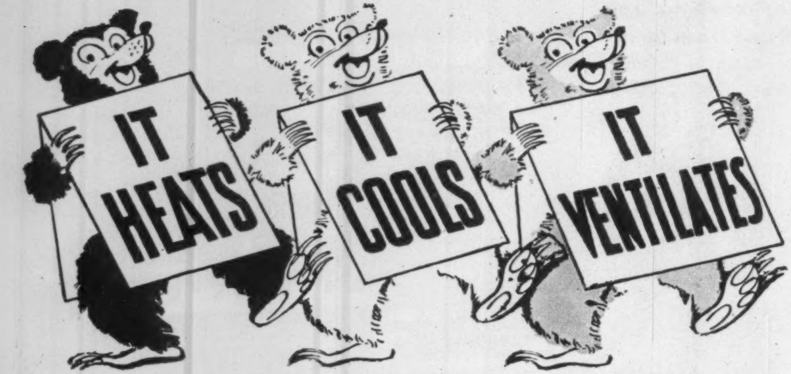
Integral Water Column on No. 157 —In all other ways identical with the No. 150, the No. 157 has integral water column which simplifies installation on boilers with separate water columns.

Heavy Welded Monel Float —Rugged, durable, corrosion-resistant. Unusually ample clearances around float in chamber—no danger of binding.

These are the McDonnell-developed features that make the No. 150 the standard of value. No other pump control and low water cut-off offers so much field experience and time-proved dependability.

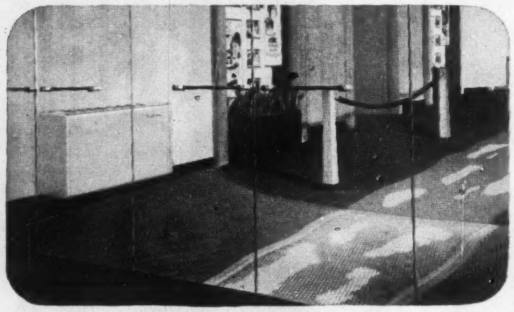
Doing One Thing Well

McDONNELL & MILLER, INC. • 3500 NO. SPAULDING AVE. • CHICAGO 18, ILL.



You can't beat a Modine Cabinet Unit for low-cost, year-'round comfort!

Type BT Cabinet Unit with optional plenum base.



THEATER LOBBY is economically heated and cooled by wall-hung Type BT Cabinet Units.

CHURCH is quickly brought up to temperature on cold mornings by recessed Type BF units.

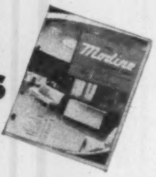
BANK DOORS are curtained off with a blanket of heated air from a Modine Type FE unit.

HERE'S the economical way to heat, cool and ventilate large public rooms. The Modine Cabinet Unit gives you quick, positive, quiet distribution of heated or cooled air . . . with or without ducts. Adding inexpensive accessories also permits introduction, filtering, heating and distribution of fresh outside air for ventilation.

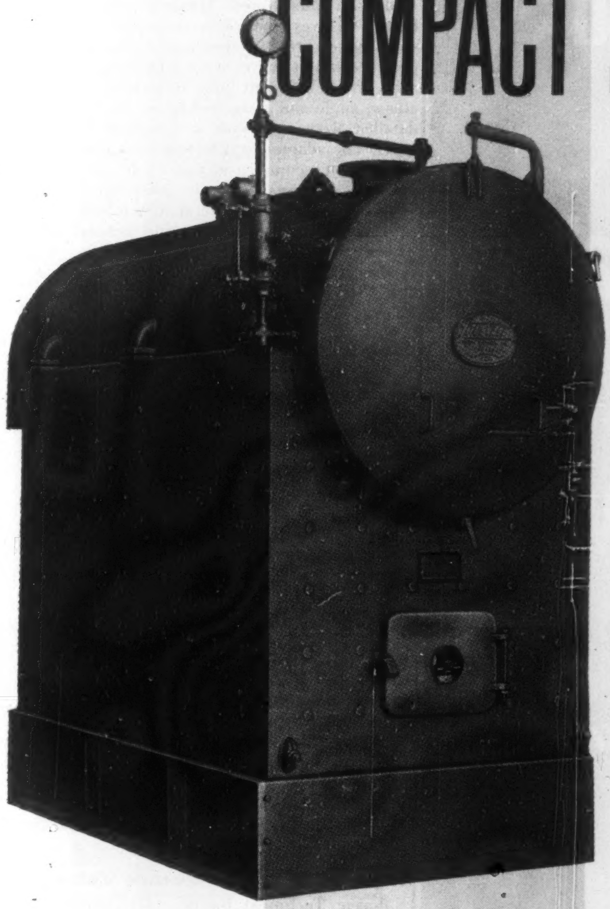
You can choose from five models—some for heating plus cooling with chilled water . . . others for heating with steam or hot water only. Get the facts today on how you can replace two or three old-fashioned, unsightly cast iron radiators with one Modine Cabinet Unit. See the Modine representative listed in your classified phone book. Or write for Bulletin 552 to Modine Manufacturing Company, 1509 DeKoven Avenue, Racine, Wisconsin.

C-1217

Modine
CABINET UNITS



"COMPACT" IS THE WORD FOR THIS SPACE-SAVING TITUSVILLE BOILER

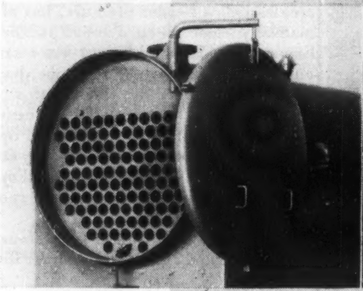


ALL SIZES FROM 129 TO 2500
SQ. FT. OF HEATING SURFACE

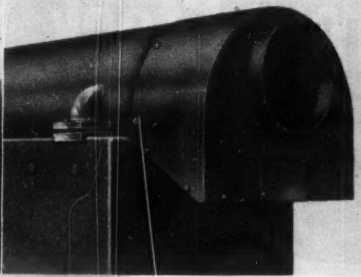
S.B.I. rated for known, dependable performance

Modern, space-saving design makes the "Compact" Steel Heating Boiler particularly adaptable to cramped boiler-room areas . . . sturdy welded construction, large combustion chambers, long fire travel and positive circulation combine for high efficiencies and years of low-maintenance service! Get the facts—write for "Compact" Bulletin B-3000-B today.

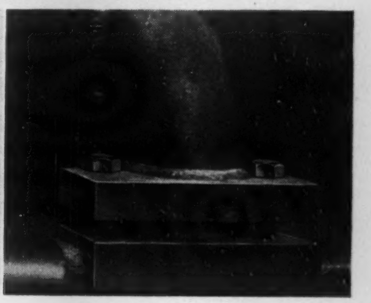
TYPICAL "COMPACT" ENGINEERING FEATURES



Full width flue doors give quick access to all tubes for cleaning.



Smoke box at rear of boiler provides a natural soot hopper, easily cleaned.



Ample number of side circulators insure positive circulation, increased efficiency.

TITUSVILLE
IRON WORKS CO
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A DIVISION OF Struthers Wells

THE TITUSVILLE IRON WORKS COMPANY
TITUSVILLE, PENNA.
Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

Golden-Anderson

Cushioned

Boiler Non-return Valves

and

Steam Check Valves

in sizes

2" through 30"

are now

Available from Stock

IN MOST SIZES

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GOLDEN ANDERSON *Valve Specialty Company*

1210 RIDGE AVENUE, PITTSBURGH 33, PA., FAirfax 2-8130

DESIGNERS AND MANUFACTURERS OF:

Non-Return Valves • Altitude Valves • Solenoid Valves • Engine Stop Valves • Swing Check Valves
Float Valves • Pressure Reducing Valves • Surge Relief Valves for air, gas, steam and water

RECENT TRADE LITERATURE...

Boiler Non-Return Valves

6-page Bulletin S-2 fully describes Golden-Anderson Cushioned Single-Acting Non-Return Valves, which automatically close when boiler pressure decreases below header pressure, as in the case of a bursting boiler tube. Three different yoke assemblies on the elbow, angle and globe bodies are featured in detailed drawings, with a complete list of parts. The adaptability, testing, construction, installation, sequence of operation, servicing and specifications are fully described, along with tables showing general dimensions, approximate shipping weight, and general list of materials.

Manufacturer—Golden-Anderson Valve Specialty Co., 1210 Ridge Avenue, Pittsburgh 33, Pa.

Steam Check Valves

Technical Bulletin WS-1 describes Golden-Anderson Hydraulic Double Cushioned Check Valves, which are especially designed for boiler feed lines. Two detailed drawings show the complete list of parts. The application, construction, sizes and pressures are fully described along with tables showing general dimensions and figure numbers.

Manufacturer—Golden-Anderson Valve Specialty Co., 1210 Ridge Avenue, Pittsburgh 33, Pa.

Pressure Loss Calculator

Especially designed for Power Engineers, the new Golden-Anderson Slide-Chart Pressure Loss Calculator quickly estimates pressure drop and indicates proper size Steam Valve needed for any steam pressures up to 1500 psi. Full operating instructions and necessary technical data are printed on the calculator.

Published by—Golden-Anderson Valve Specialty Co., 1210 Ridge Avenue, Pittsburgh 33, Pa.

Triple-Acting Non-Return Valves

8-page Technical Bulletin S-1A fully describes Golden-Anderson's Cushioned Triple-Acting Non-Return Valves, which not only automatically close when boiler pressure decreases below header pressure, but also automatically close when a break in the header line occurs. Three different yoke assemblies on the elbow, angle and globe bodies are featured in detailed drawings, with a complete list of parts. The adaptability, testing, construction, installation, sequence of operation, servicing and specifications are fully described, along with tables showing general dimensions, approximate shipping weight, and general list of materials.

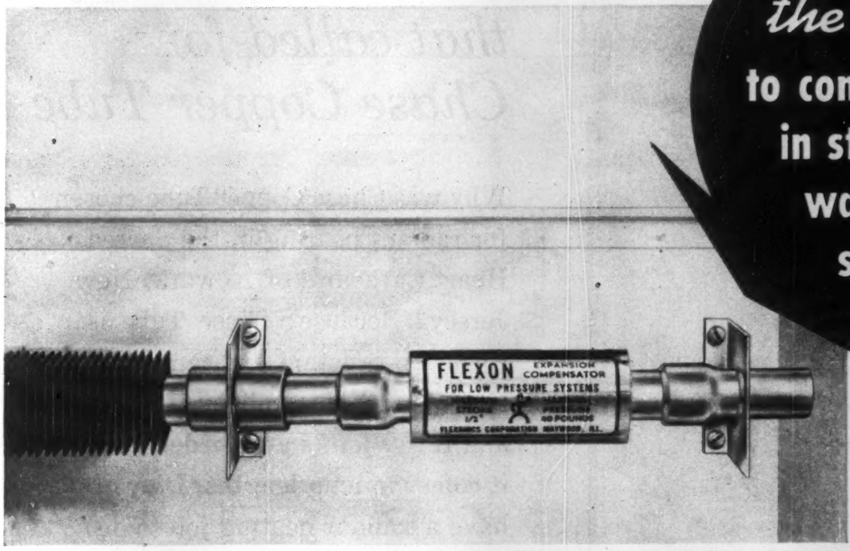
Manufacturer—Golden-Anderson Valve Specialty Co., 1210 Ridge Avenue, Pittsburgh 33, Pa.

Engine Stop Valves

New 6-page Bulletin S-3 contains the latest technical data on Golden-Anderson Cushioned Engine Stop Valves, which prevent fly-wheel explosions by automatically shutting down a turbine, compressor or engine in the event of over-speeding. Tables of parts and dimensions are given, along with detailed descriptions of application, fabrication, installation, sequence of operation and specifications.

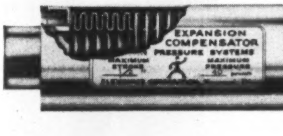
Manufacturer—Golden-Anderson Valve Specialty Co., 1210 Ridge Avenue, Pittsburgh 33, Pa.

Here's the right way
to control expansion in steam and hot water heating systems...



THE *New* FLEXON EXPANSION COMPENSATOR...

DESIGN DETAILS



The Flexon Expansion Compensator consists of a two ply phosphor bronze bellows with copper tube end connections (sizes ¾″ to 1¼″) enclosed in a floating protective shroud of brass. All joints are electronically sealed with silver solder for long leak-proof life. The 2″ size is especially guided and has standard threaded fittings. A single compensator will handle total piping motion up to ⅝″ (½″ in compression, ⅛″ in extension). Suitable for temperatures from —60° F. to 250° F. and for pressures up to 40 psig.

Control of thermal expansion in low pressure steam and hot water heating systems need not be a headache any longer. The new Flexon Expansion Compensator provides a practical, economical answer to the problem. Designed especially for finned type convectors, baseboard, radiator or heating supply or return lines, the Flexon Expansion Compensator is ideally suited for use in homes, office buildings, schools or any buildings where expansion in heating piping is a problem.

The Flexon Expansion Compensator is practical because it puts an end to leakage that often results from uncontrolled expansion and eliminates objectionable pipe creeping noises. It is economical because it is designed to outlast the building and requires no maintenance whatsoever. Just install it and forget it.

Flexon Expansion Compensators are made in ¾″, 1″, 1¼″ and 2″ sizes. Contact your local distributor for further information, or use the coupon below to get your copy of a descriptive bulletin.

Flexonics *Corporation*

Flexon identifies products of Flexonics Corporation that have served industry for over 52 years.

EXPANSION JOINT DIVISION
1391 S. Third Avenue
Maywood, Illinois

Flexonics Corporation
1391 S. Third Ave.
Maywood, Ill.

Please send me the bulletin which describes and gives full specifications for the Flexon Expansion Compensator.

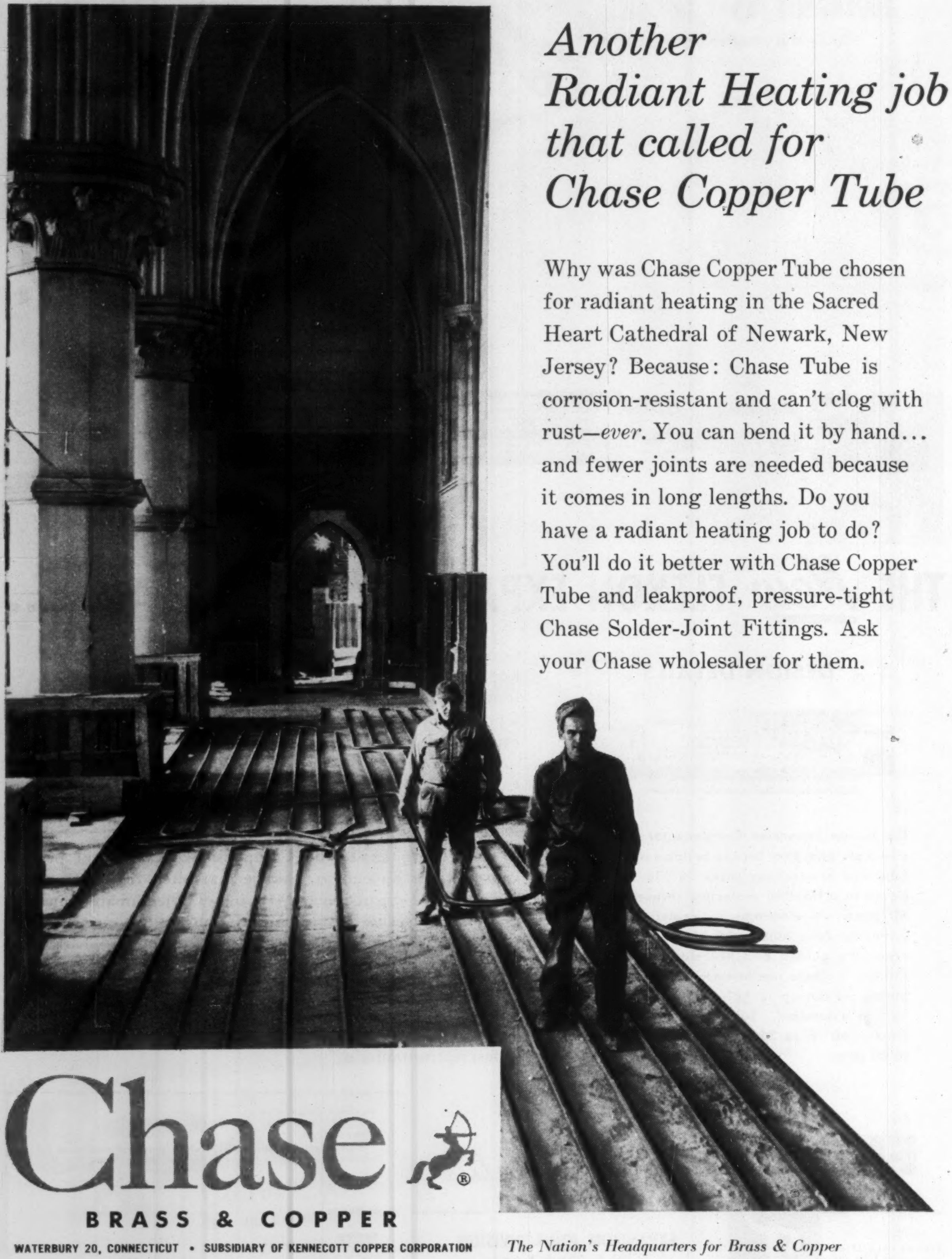
Name ....

Company ....

Address ....

City .... Zone .... State ....

My Wholesaler is: ....



Another Radiant Heating job that called for Chase Copper Tube

Why was Chase Copper Tube chosen for radiant heating in the Sacred Heart Cathedral of Newark, New Jersey? Because: Chase Tube is corrosion-resistant and can't clog with rust—*ever*. You can bend it by hand... and fewer joints are needed because it comes in long lengths. Do you have a radiant heating job to do? You'll do it better with Chase Copper Tube and leakproof, pressure-tight Chase Solder-Joint Fittings. Ask your Chase wholesaler for them.

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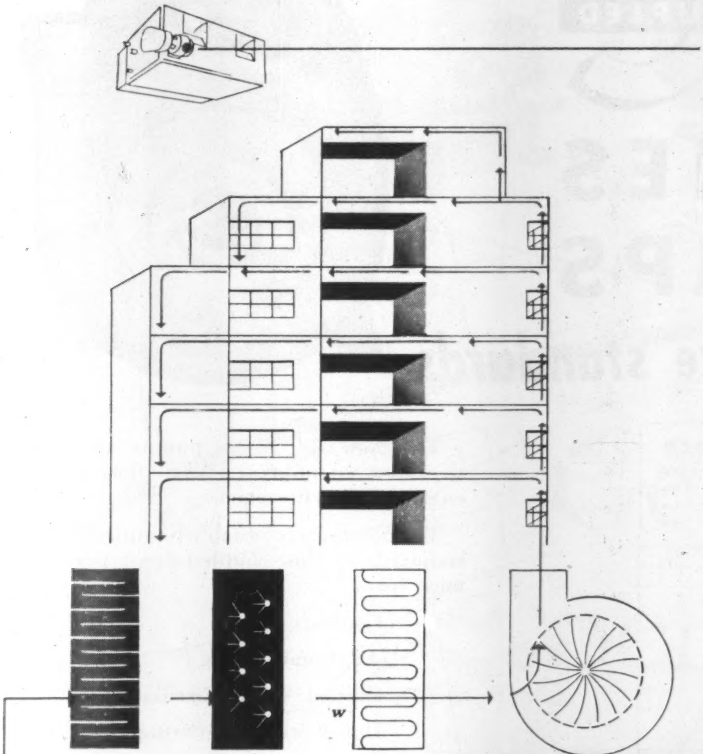
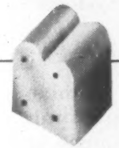
THE MARK OF
EXTRA DEPENDABLE
REFRIGERATION AND
AIR CONDITIONING EQUIPMENT

ED
ELECTRO DYNAMIC

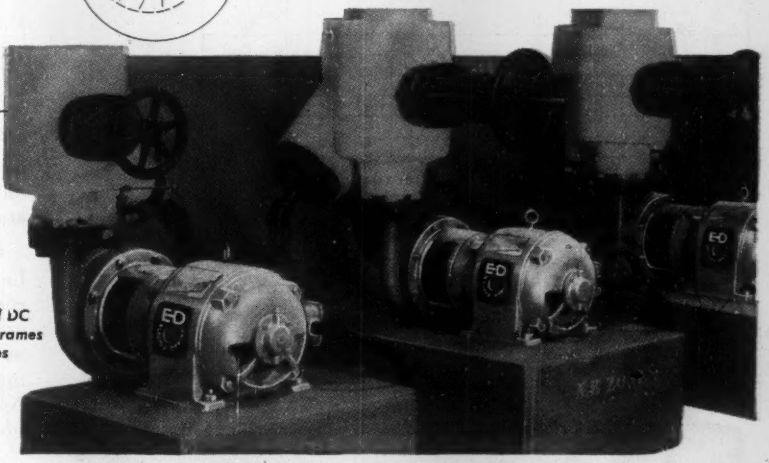




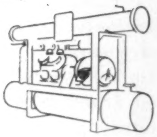
The red "power spot" on refrigeration or air conditioning equipment means *powered by Electro Dynamic*, the most dependable motors *ever* available to industry.

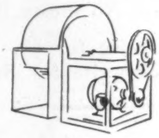
For *proof* of this *extra dependability* send the coupon below for your copy of **"MOTOR SHOWDOWN"**, a new candid report on comparative results of motor performance tests* conducted in accordance with A.I.E.E. standards.

*Tests certified by J. Arthur Balmford, Professor of Electrical Engineering at a leading Eastern University.



1 to 250 hp., AC and DC
N.E.M.A. standard frames
All types of enclosures





ELECTRO
Extra
DYNAMIC
Dependable motors

ELECTRO DYNAMIC
Division of General Dynamics Corporation
150 Avenue A, Bayonne, New Jersey

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MOTOR SHOWDOWN

Please send me a copy of "MOTOR SHOWDOWN" and the new catalog of Electro Dynamic industrial motors.

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COMPANY____________________
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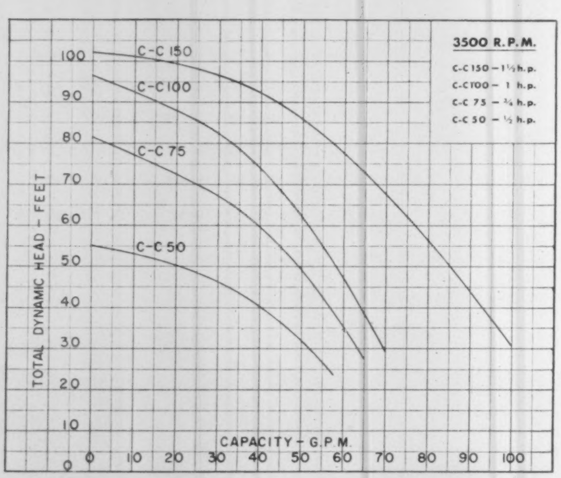
New CC CLOSE-COUPLED SERIES PUMPS

Set new performance standards

CHICAGO
PUMP CO



Each pump operates over the entire range of its curve without motor overload.

The New C-C Series pumps are more than just an improved line—they are an engineering achievement.

They definitely establish entirely new standards in close-coupled pump performance for:

Cooling Towers
Air Conditioning
Chilled Water Circulating
Hot Water Circulating
Pneumatic Water Systems
Booster Systems

The C-C Series pumps combine pump and motor in a single compact unit, eliminating coupling and alignment problems and assuring easy installation.

C-C Series pumps are equipped with a Leak-Proof "Chicago Mechanical Seal" consisting of a fixed-in-place carbon ring on a ceramic seat which is extremely hard and resistant to wear and corrosion. No maintainance or adjustment is necessary. No expensive piping is needed from drip pocket to drain. No messy floors.

See curves above for ½, ¾, 1 and 1½ H.P. models or write for Bulletin 108 F.

All models in stock for immediate shipment.

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BUILDING and INDUSTRIAL DIVISION

622 DIVERSEY PARKWAY **CHICAGO 14, ILLINOIS**

Condo-Vac, Sure Return. AVC, LVC,
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Pneumatic & Tankless Water Systems.

Flush-Kleen Sewage Ejectors
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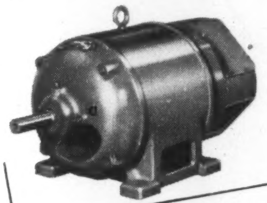
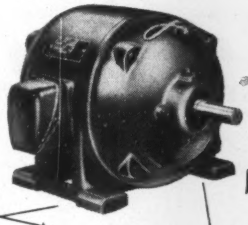
Pumps for every industrial use.

Wound Rotor motor. When you need adjustable speed over a limited range, or a means of limiting starting current, the Wound Rotor motor may be the answer. Built up to 1000 horsepower.



High torque compressor motor. Any motor enclosure that you require, in a wide range of horsepower. Special electrical characteristics for the starting torque for your loaded compressors. Open Drip-proof enclosure pictured.



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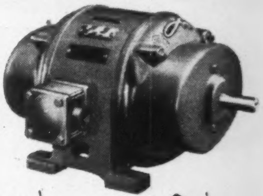
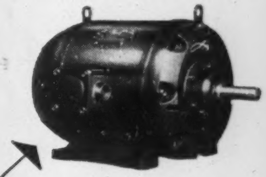
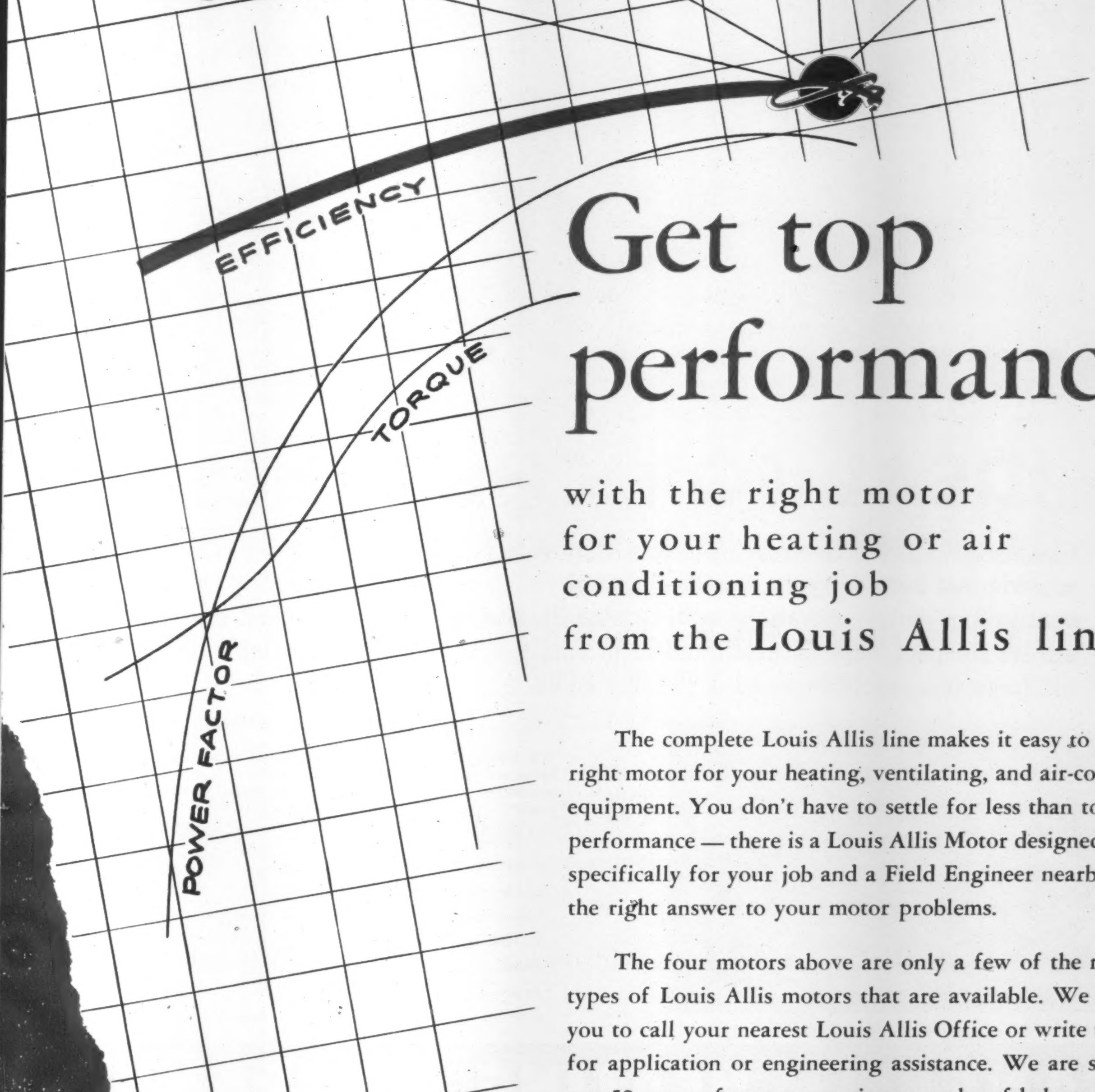


Part Winding motors. Part Winding or Increment Start motors for use on power circuits using automatic voltage regulators are available in all enclosures (Fan-cooled pictured) and with standard and high torque characteristics. We will be glad to supply an increment type starter with the motor if you desire it.





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The complete Louis Allis line makes it easy to get the right motor for your heating, ventilating, and air-conditioning equipment. You don't have to settle for less than top performance — there is a Louis Allis Motor designed specifically for your job and a Field Engineer nearby, with the right answer to your motor problems.

The four motors above are only a few of the many types of Louis Allis motors that are available. We invite you to call your nearest Louis Allis Office or write to us for application or engineering assistance. We are sure that our 52 years of motor experience can be of help to you.

THE LOUIS ALLIS CO.
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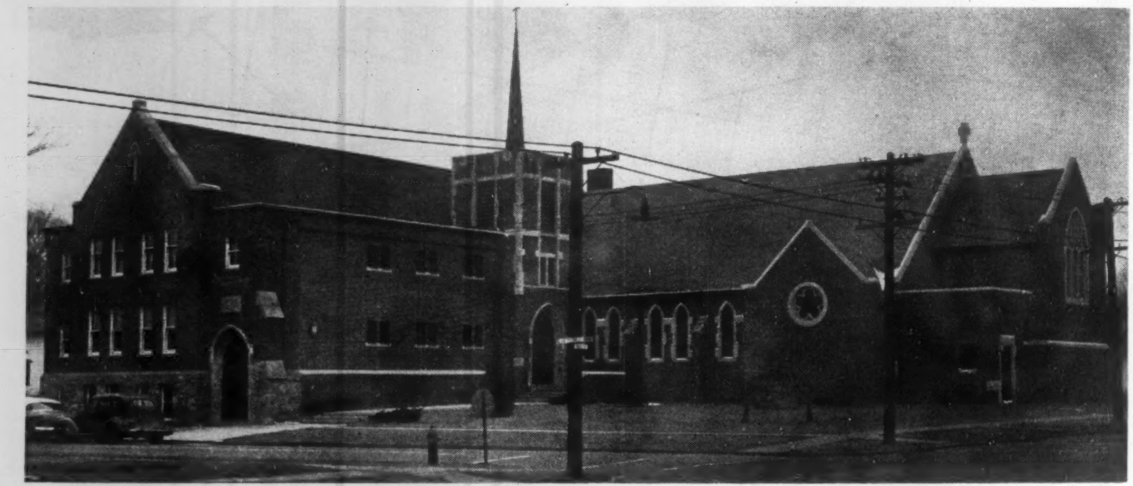
WARM AIR HEATED...

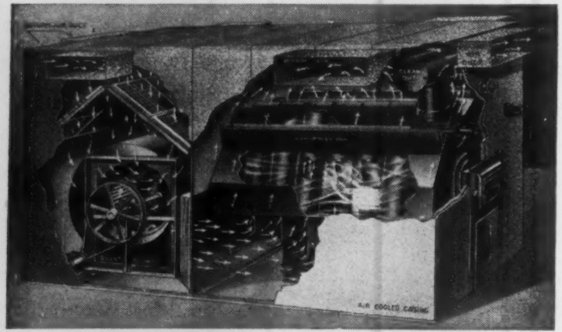
by Campbell



Grandview Lutheran Church, Des Moines. Campbell No. 8125 Heater installed when original building was constructed in 1927. A No. 8100 Campbell gas-fired Heater was installed in an addition to the church built in 1950. Architects for 1950 addition, Haynes and Griffith; Heating contractor, Hanbury Sheet Metal Co., Des Moines.

IDEAL FOR CHURCHES

Campbell Warm Air Heaters meet every requirement for church heating. They provide fast heat delivery; positive control of temperature, humidity and ventilation; quiet operation, and outstanding fuel economy. Campbell Heaters are compact, easy to install and surprisingly low in cost. Available for all fuels in capacities up to 3,000,000 BTUs.



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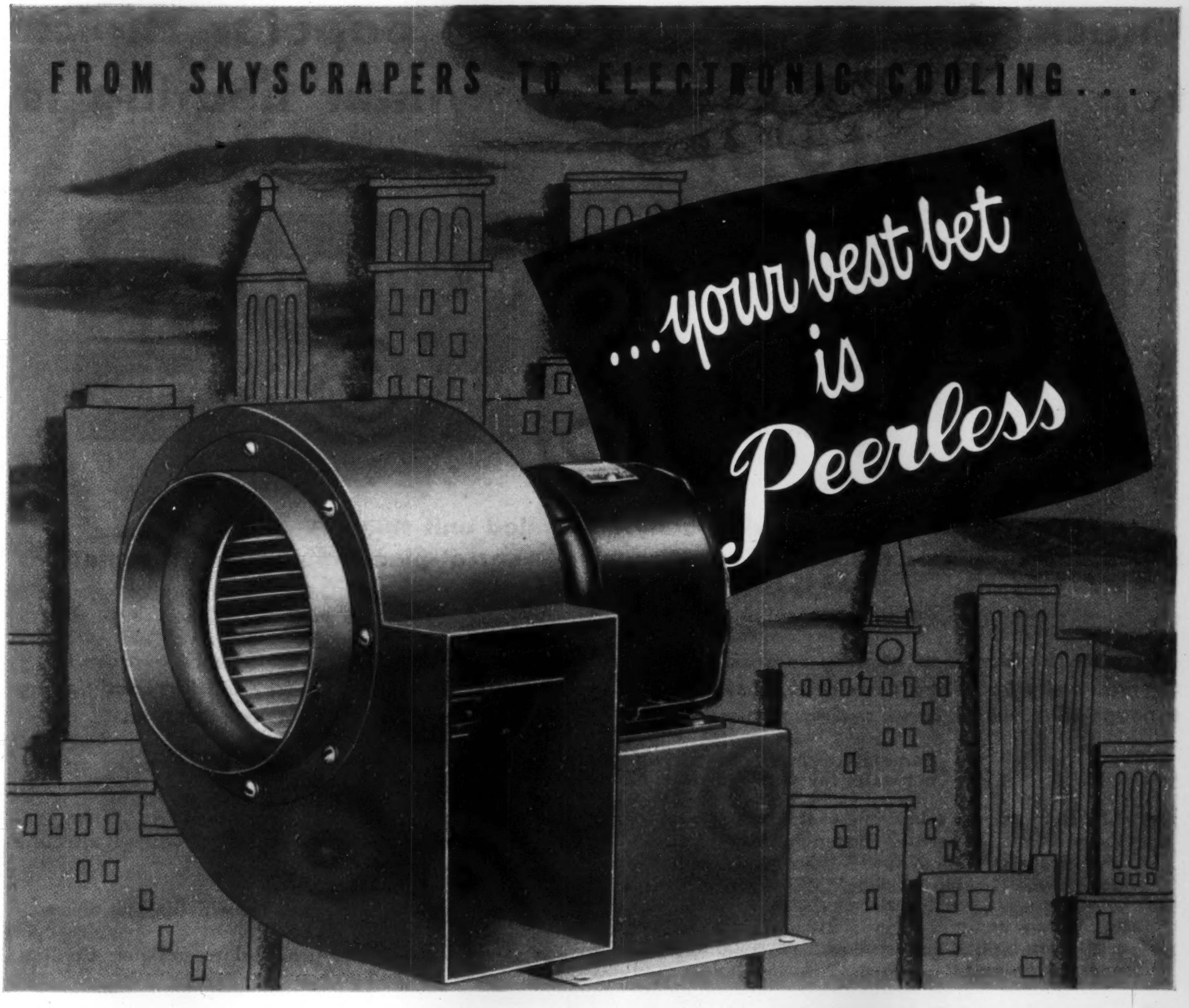
CAMPBELL HEATING COMPANY

Des Moines 17, Iowa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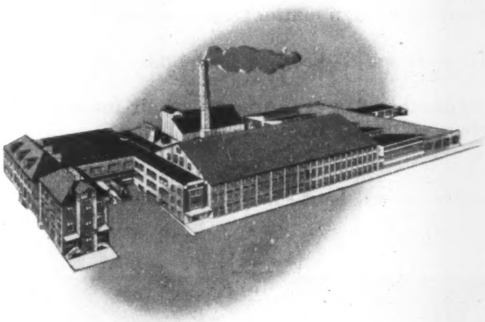
Since 1893, Peerless Electric has been headquarters for all types of air-moving equipment, so, no matter what your plans . . . whether you're designing skyscrapers or cooling electronic mechanisms, it'll pay you to get the facts first from Peerless. Write today for illustrated catalog SDA 160.



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THE PEERLESS ELECTRIC COMPANY
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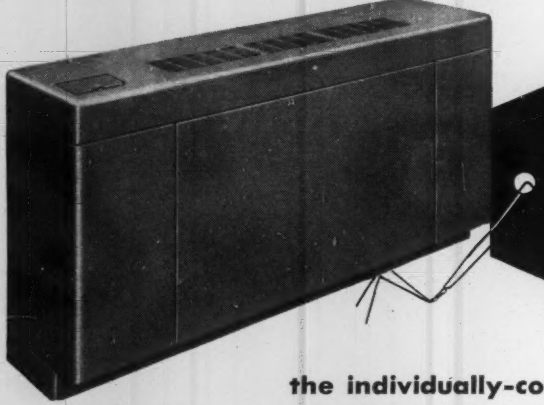

The REMOTAIRE
by
AMERICAN-Standard

the individually-controlled unit that filters and circulates the air all year 'round in central-plant, multi-room installations

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Architects, builders and heating contractors like the Remotaire because it's versatile, easy and economical to install, space saving.

Building owners like the Remotaire because it provides healthful, draft-free comfort conditioning all year 'round with minimum attention.

- ✓ Same simple piping circuit supplies chilled water for summer cooling, hot water for winter heating. No unwieldy ductwork needed.
- ✓ The Remotaire is adaptable to the best system for the job—Wall Aperture System, Interior Ventilation System, Well Water System, Split-coil System, Motel System, Residential System, Modernization System.
- ✓ Units can be installed recessed, partially recessed or free-standing.
- ✓ Three popular sizes to choose from—200, 400, 600 cfm. A size for every job.
- ✓ Easy to service. Every part of the assembly can be reached easily, quickly.
- ✓ Easy to maintain. Motor assembly can be taken out and replaced in less than 15 minutes.
- ✓ Reversible coil is designed for right or left hand connection. Easily reversed in the field.
- ✓ Special electrical junction box is easy to get to.
- ✓ Sturdily built . . . doesn't have to be pampered in installation. (Reinforced grille will support weight of 200 lb. man!)
- ✓ Each unit is individually controlled . . . temperature in each room can be changed without affecting adjoining space.
- ✓ The Remotaire is quiet. No whistling-jet noises.
- ✓ Handsome jacket, furnished in semi-gloss Cooltan, can be painted any color.
- ✓ Toe-step offset permits better fitting of rugs around units and eliminates marring of front when cleaning floors.
- ✓ Drain pan protection. Large pan runs entire length of unit to prevent condensation drip. Grille shield prevents foreign matter from entering through top.
- ✓ Large filters . . . keep air fresh and clean.
- ✓ Adjustable damper. Amount of air intake can be changed at any time.
- ✓ Wall seal. Rubber molding around back panel provides air seal between unit and uneven plaster.

For further information on the Remotaire see Sweet's Architectural File or contact your nearest American-Standard sales office for descriptive literature.

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HEATING-COOLING SYSTEMS

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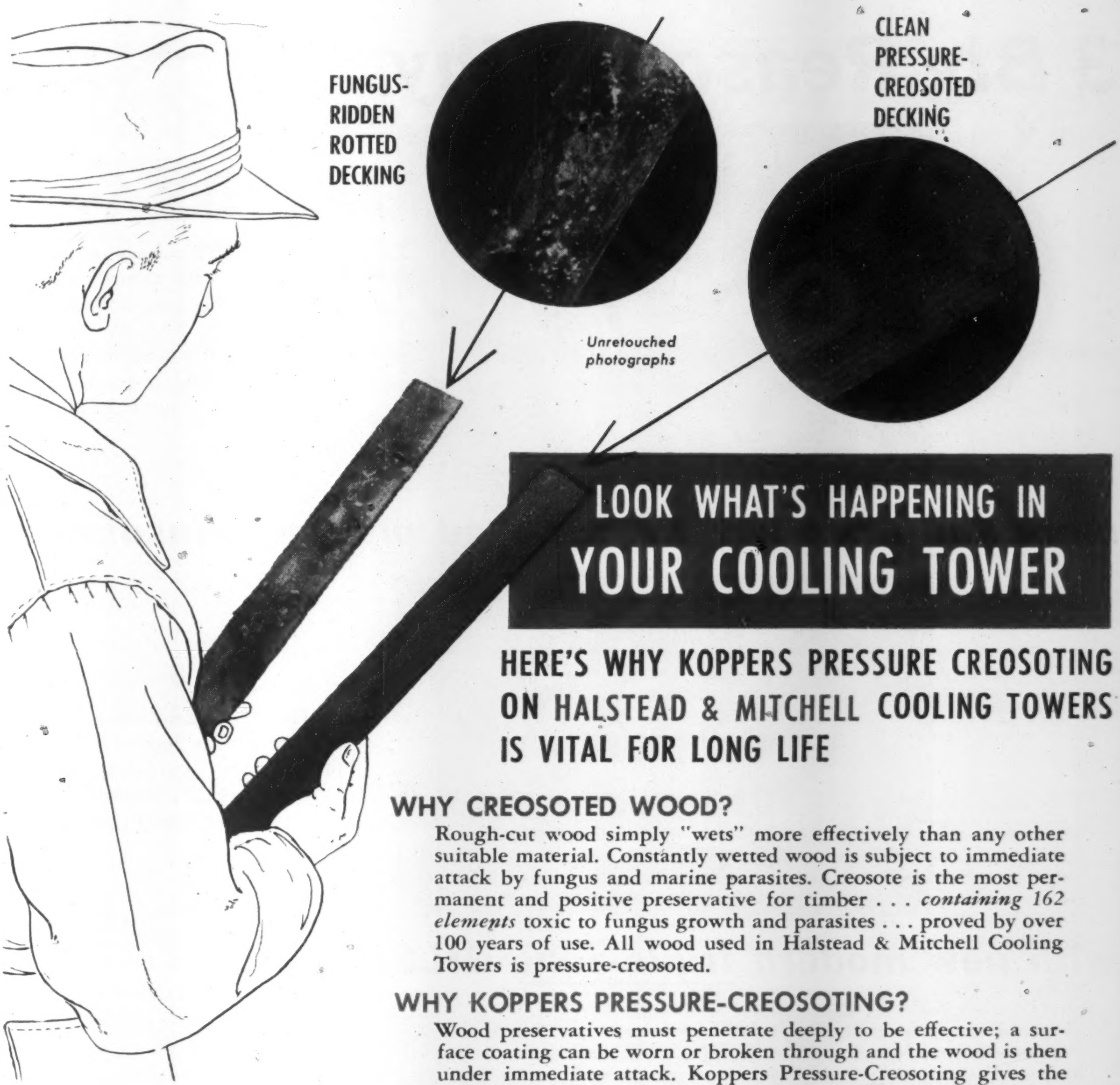
Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS


FUNGUS-RIDDEN ROTTED DECKING
CLEAN PRESSURE-CREOSOTED DECKING
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LOOK WHAT'S HAPPENING IN YOUR COOLING TOWER

HERE'S WHY KOPPERS PRESSURE CREOSOTING ON HALSTEAD & MITCHELL COOLING TOWERS IS VITAL FOR LONG LIFE

WHY CREOSOTED WOOD?

Rough-cut wood simply "wets" more effectively than any other suitable material. Constantly wetted wood is subject to immediate attack by fungus and marine parasites. Creosote is the most permanent and positive preservative for timber . . . *containing 162 elements* toxic to fungus growth and parasites . . . proved by over 100 years of use. All wood used in Halstead & Mitchell Cooling Towers is pressure-creosoted.

WHY KOPPERS PRESSURE-CREOSOTING?

Wood preservatives must penetrate deeply to be effective; a surface coating can be worn or broken through and the wood is then under immediate attack. Koppers Pressure-Creosoting gives the deepest possible penetration and longest possible life. Therefore, Halstead & Mitchell wetted decks are Koppers Pressure-Creosoted.

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE

against rotting by fungus attack

2 thru 100 Tons

Sheet-Steel Cabinets,
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Stainless Steel Fans and Shafts
Weather Shielding
Gravity-Type Distributing Pans
  —no windage loss
Everdur Bolts for ease of
  disassembly at any time.

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Halstead & Mitchell

OFFICES: Bessemer Bldg., Pittsburgh 22, Pa.

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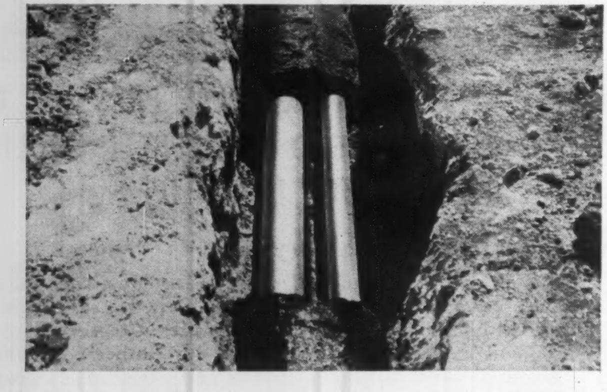
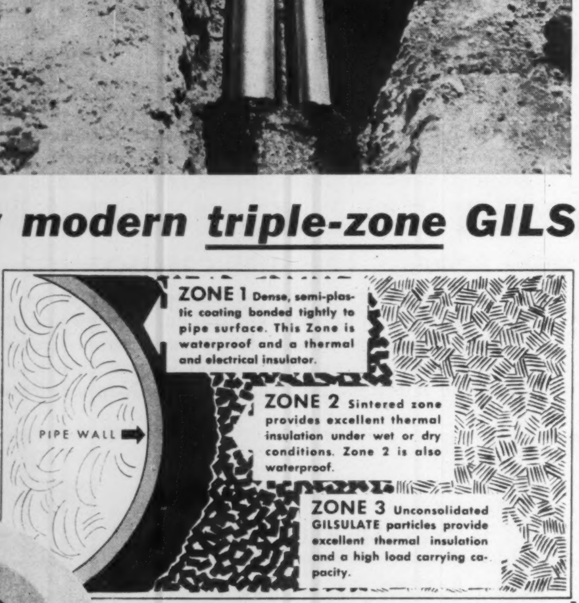
1. **GILSULATE—Easy to install**—Just pour it on, tamp it down and backfill. Run heat through the pipes (up to 520°F)...and the job is completed. No need to remove rocks from backfill; no problems of cramped space or multiple piping.

more and more hot underground pipe gets insulated



2. **GILSULATE—Cost Less per Installed Linear Foot**—No skilled labor needed... requires no mechanical sheaths, special protective devices, or costly installation procedures.

with new modern triple-zone GILSULATE®


ZONE 1 Dense, semi-plastic coating bonded tightly to pipe surface. This Zone is waterproof and a thermal and electrical insulator.
ZONE 2 Sintered zone provides excellent thermal insulation under wet or dry conditions. Zone 2 is also waterproof.
PIPE WALL
ZONE 3 Unconsolidated GILSULATE particles provide excellent thermal insulation and a high load carrying capacity.

3. **GILSULATE—Delivers Permanent Triple-Zone Protection**—Three tough, massive circular sheaths completely and permanently protect the pipe, cut heat loss down to 8% to 11% of bare buried pipe. Triple-zone protects against all buried line corrosion conditions: water, roots, acid, alkalis, bacteria, etc.

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FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES

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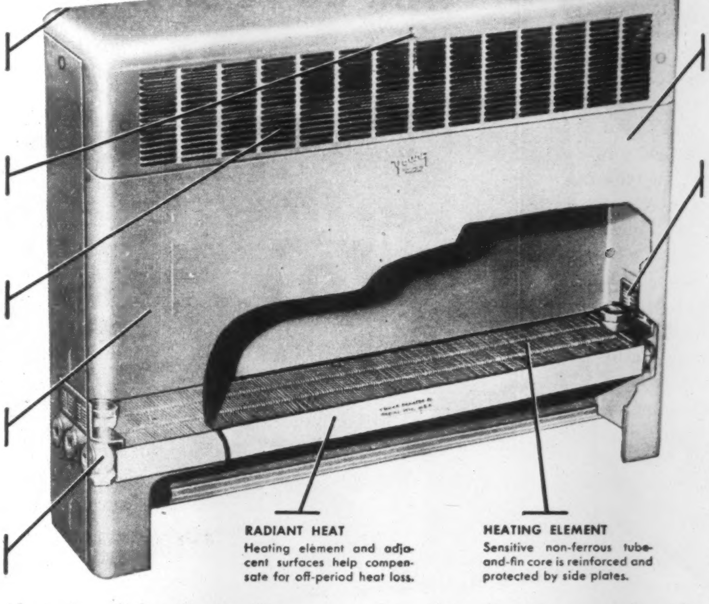
There's More than Meets the Eye in YOUNG CONVECTORS

Take a look inside a Young Convector. Right away, you'll see many "hidden values" in Convector design features and construction quality. Such built-in value places Young Convectors in a class above the ordinary . . . assures easy installation, heating comfort and economy.



AIR SEAL
Strips of felt and/or corner gaskets prevent air leaks and resultant wall streaking.

DAMPER CONTROL
Chain control regulates damper and rate of air flow thru cabinet and heating element.

OVER-SIZE GRILLE
Louvers direct air outward and permit abundant heat delivery . . . greater capacity.

MODERN CABINET
Finished in prime coat . . . can be painted to match decor . . . safe, rounded corners.

SIMPLIFIED PIPING
Cabinet knock-outs and header casting design permit piping from top and bottom.

RADIANT HEAT
Heating element and adjacent surfaces help compensate for off-period heat loss.

HEATING ELEMENT
Sensitive non-ferrous tube-and-fin core is reinforced and protected by side plates.

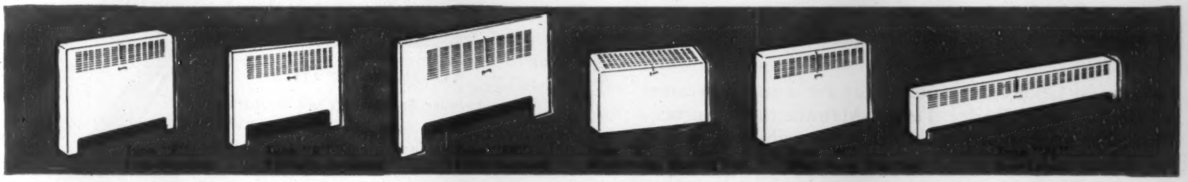
EASY TO CLEAN
One-piece front panel is easily removed for seasonal cleaning.

SIMPLIFIED HEATING ELEMENT SUPPORTS
Provide quick installation and pitching adjustments. Hold heating element securely.

PACKAGED FOR PROTECTION
Reinforced, stapled cartons protect convectors. Marked for easy identification.

STANDARD RATINGS
The ratings of Young Convectors have been determined in conformance with Commercial Standard CS 140-47, as developed cooperatively by the trade and the National Bureau of Standards, U. S. Department of Commerce, and the said ratings have been approved by the Convector Rating Committee.

Whether you specify or install heating equipment, you'll be way ahead with Young Convectors. Only Young offers all the design features shown above. Young supplies Convectors at low initial cost, with six standard types available from stock to meet early delivery dates. Remember, too, every Young Convector has been rated and approved in conformance with Commercial Standard CS140-47. These advantages all add up to greater convenience for you . . . greater satisfaction for your clients or customers. For further details, see nearest Young Representative or write for catalog.



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Heating, Cooling, Air Conditioning Products for Home and Industry

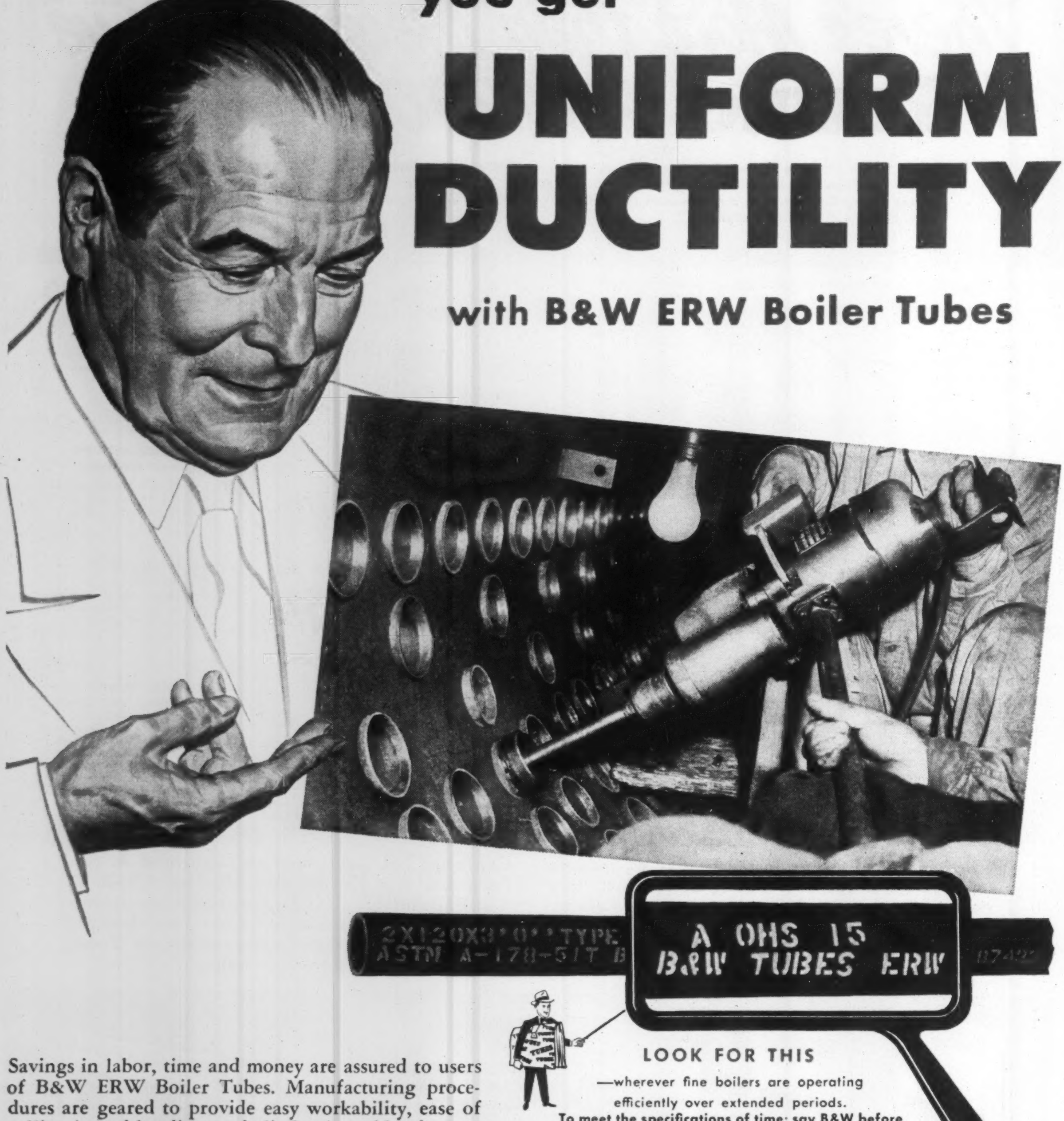
Heat Transfer Products for Automotive, Agricultural, Industrial, Gas and Diesel Engine Applications

Leaders in Heat Transfer Engineering for more than 25 years

CONTRACTORS

All Young Convectors are packaged in clearly marked, reinforced cartons for unit protection and ease in identification on the job. Adjustable support (see above) also holds heating element rigidly in place and permits shipping element in cabinet for quicker installation.

you get
UNIFORM DUCTILITY
with B&W ERW Boiler Tubes



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—wherever fine boilers are operating efficiently over extended periods.

To meet the specifications of time; say B&W before you say WELDED BOILER TUBES—for service-proved dependability.

Savings in labor, time and money are assured to users of B&W ERW Boiler Tubes. Manufacturing procedures are geared to provide easy workability, ease of rolling-in and beading, and elimination of hard spots. Because B&W electric-resistance-welded boiler tubes have all-the-way through and uniform ductility, you can readily expand them into tube seats and make joints which stay tighter longer.

For three-quarters of a century, B&W has been directly concerned with developing and applying boiler tubes for all pressures up to those approaching 3000 psi. The application of this extensive knowledge and experience results naturally in the production of finer welded boiler tubes.

If you want ease of fabrication and long service life for the tubing in your boiler—specify B&W ERW Boiler Tubes.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-1815(A)

THE EDITORS' PAGES

Air Conditioning Enters "Boom Phase" Expected To Last "at Least 10 Years"

. . . Worthington's president reviews industry

SUMMING UP a "review and outlook" for the air conditioning industry — prepared for the third eastern regional conference of the National Federation of Financial Analysts Societies, held in New York City the end of January — Hobart C. Ramsey, president of the Worthington Corp., said that:

1) The air conditioning industry is now entering a boom phase expected to last at least 10 years.

2) Competition is becoming continually keener as new producers enter the field, but except in the case of room coolers there is no sign yet of overcrowding.

3) Advances in engineering and design are occurring constantly, and more can be expected.

4) In the long run, growth and survival will depend upon the individual producer's ability to keep abreast of developments, both in demand and design; upon good sales distribution and service; and upon the efficiency, reliability and cost of the product.

In 1953, the air conditioning industry has been calling itself, with some justice, a billion-dollar industry. Estimates of 1953 production and sales for the industry as a whole range from almost $1 billion to more than $1.75 billion, and it has become fashionable to predict growth up to $5 billion a year by 1963, he said.

He listed the four basic types of air conditioning equipment as:

The Room Cooler, of less than 2 hp, including both window sill and console units.

The Commercial Packaged Unit, of 2 to 15 hp, which can be used with or without ductwork; and to which a heat generating element may be attached.

The Year'-Round Residential Unit, of 2, 3, 5 or 7½ hp, in which the cooling unit is either added to the heating unit or combined with it in one package.

Central Station equipment for large commercial and industrial structures.

Overall estimates are comprised of the costs of essential equipment plus such installation costs as ductwork, piping, electrical equipment and (frequently) structural alterations. They lift this industry into the billion-dollar bracket.

Making all reasonable allowances for optimistic inflation of these statistics, it is nevertheless clear that air conditioning is now big business, and is destined to become bigger still. After 50 years of relatively slow development interrupted by depression and war, air conditioning has at last won definite consumer acceptance, he said.

Since 1950 it has entered on the steep growth curve typical of new industries under favorable conditions. For the next 10 years it is safe to predict a continuing expansion of production capacity and merchandising effort in this field. Ultimately, it is expected that air conditioning equipment will come into general use throughout the nation, and every modern structure will be air conditioned, he predicted.

Air conditioning was first introduced as a necessity for certain industrial processes (such as textiles, tobacco and printing) where it is important to control air temperatures and humidity and to remove dust from the air, he said. The use of air conditioning in manufacturing plants and laboratories led to the discovery that cool, clean, dry air is good for people as well as for products. Furthermore, while it is important only for a select group of products, it is important to all people, he went on. Air conditioning in factories has been shown to reduce fatigue and thus promote efficiency and reduce accidents; reduce sickness and therefore absenteeism; make the plant a more pleasant place to work in and thereby reduce both voluntary absenteeism and labor turnover; and in all these ways to reduce production costs.

It would probably be premature, he said, to say that air conditioning is a "must" for all new plants planned or under construction this year. However, it is certainly a "must" for all plants and manufacturers who aspire to be regarded as "modern".

Ultimately, competition will force all manufacturers to adopt this method of cutting costs, he predicted. The process may be hastened by improvements in air conditioning equipment to lower costs and increase efficiency, or by a business recession sufficient to sharpen competition.

Air conditioning moved into the commercial field in the 1920's and 1930's when technical developments made its use possible in theaters, department stores, railroad cars, hotels, restaurants, office buildings, public buildings, and small retail stores.

In each field it became a competitive necessity almost as soon as it was introduced — first among the larger and more expensive establishments, and then by stages down to the smaller ones. Comfort for the customer proved itself immediately as an immensely valuable aid; it not only draws the customers away from the establishments of non-air conditioned competitors, but it also makes them stay longer and buy more because they feel better.

As in the case of plant air conditioning, it is safe to say that all important commercial buildings will ultimately have to be air conditioned for competitive reasons, he stated. This time may come sooner in the commercial field, however. When the amount of air conditioned offices in any city reaches a given point — estimated by the American Institute of Management at 15 percent of the desirable space available — it becomes a competitive necessity for all other buildings in the city.

Adequate data are not yet avail-

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JOIN and SERVE!

able to show how many cities in the United States have reached, or are approaching, this point. Some, like Houston, are apparently already past it. New York City has apparently arrived. The AIM states that since 1947 51 new air conditioned buildings with a total floor space of 12,332,700 sq ft have been built, are under construction or planned for construction, by 1955, in the main business area (south of 61st St.). This is more than 18 percent of the floor space in the area's 343 reasonably modern but non-air conditioned buildings.

Room Coolers — Factory shipments reported in 1952 (Bureau of Census) totaled 341,000 units, at a retail value of $122,760,000, he said. Factory shipments in 1953 were estimated as 1,075,000 units, at a retail value of $315,397,500. However, it is estimated not more than 800,000 units were sold to consumers, some at considerable retail discount. Production bottlenecks kept a substantial number of units off the market until after July 4, when the peak of the buying season was past. A substantial inventory is therefore carried over to 1954, he said.

A highly competitive year for room coolers in 1954 is anticipated. Estimates of the number of producers who will be in the market range from 75 to 90, compared to 58 during 1953. This factor, plus the carry-over inventory, will make for a heavy selling year. With demand continuing strong, especially for residential use, the annual figure is expected to continue to climb until it reaches a peak of about 1,500,000 units a year, with a retail value of $540,000,000, before 1958. By that time volume production of year 'round residential units can be expected to take away much of the demand for room coolers, which may stabilize or decline in volume.

Commercial Packaged Units — Sales reporting data on equipment of this type has not been adequately standardized, and there is some overlap into room coolers and year 'round residential units. After excluding duplication as far as possible, our analysis gives the following results for commercial packaged units ranging from 2 to 15 hp, he said.

Factory shipments in 1952 totalled 55,000 units at retail value of $110,000,000, he said. Factory shipments in 1953 totalled at least 75,000 units at retail value of more than $150,000,000. As a rough thumb-rule, retail value is computed at approximately twice the manufacturer's price, to allow for such distributors' costs as contractors' overheads and service reserves. Sales volume approximately equalled the production totals, so only the normal inventory remains. The outlook for 1954 is for an increase of at least 50 percent, based upon additional production capacity installed this year or now under construction (including the new Worthington Corp. plant at Decatur, Alabama).

Looking further ahead, he expects the sale of commercial packaged equipment to approximately double in the next five years, and double again in the succeeding five years, until it levels out at approximately $500,000,000 (retail value) for 250,000 to 300,000 units a year by 1963.

Year 'Round Residential Units — We estimate 10,000 units produced and sold in 1952; 50,000 to 60,000 units in 1953; and perhaps 120,000 units in 1954, he said. The average cost to the consumer, including installation costs, ranges from $1500 to $1800, depending on size and make of the unit, whether a cooling tower is used, and whether the unit goes into a new home or an old one.

In the absence of complete statistics, it is clear that the business in 1953 was somewhat under $100,000,000. It is our estimate that this year's can be expected to double that, he said.

The upward curve in the year 'round residential units is just beginning. It is expected to hit 700,000 units by 1958 and perhaps 1,000,000 a year by 1963, which would be the peak. This field alone, including all its components, would then mean a business of at least $1.5 billion a year.

Central Station Equipment — In this field satisfactory figures are most difficult to get. It is popularly said that by 1960 the retail sales volume of central station equipment will reach $2 billion, plus $500,000,000 of equipment for trains, airplanes, automobiles and other uses.

This figure assumes a very great expansion of the industry, which is in fact taking place. It also includes the costs of structural alterations, ductwork, piping, wiring, electrical equipment, and other related costs equal to four or five times as much as the basic cooling cycle equipment. It may also include production costs for cooling cycle equipment used in industrial process work.

In view of the fact that the many components of a central station system may be made by any number of different producers in different cases, generalized figures have little meaning. However, certain statements can be made with confidence, he said.

The biggest single component of these systems in terms of cost is the complete refrigerating cycle — compressor, condenser, evaporator and motor. In large structures the prevailing practice is to install centrifugal types ranging from 150 to 1000 hp. At present about 70 percent of the production of these compressors is for air conditioning, and the balance is used for industrial work — but the percentage devoted to air conditioning is rapidly increasing.

Expansion in this field will produce a corresponding expansion in demand for related products, such as automatic controls, blowers, electrical equipment and wiring, sheet metal, cooling towers, etc., he said.

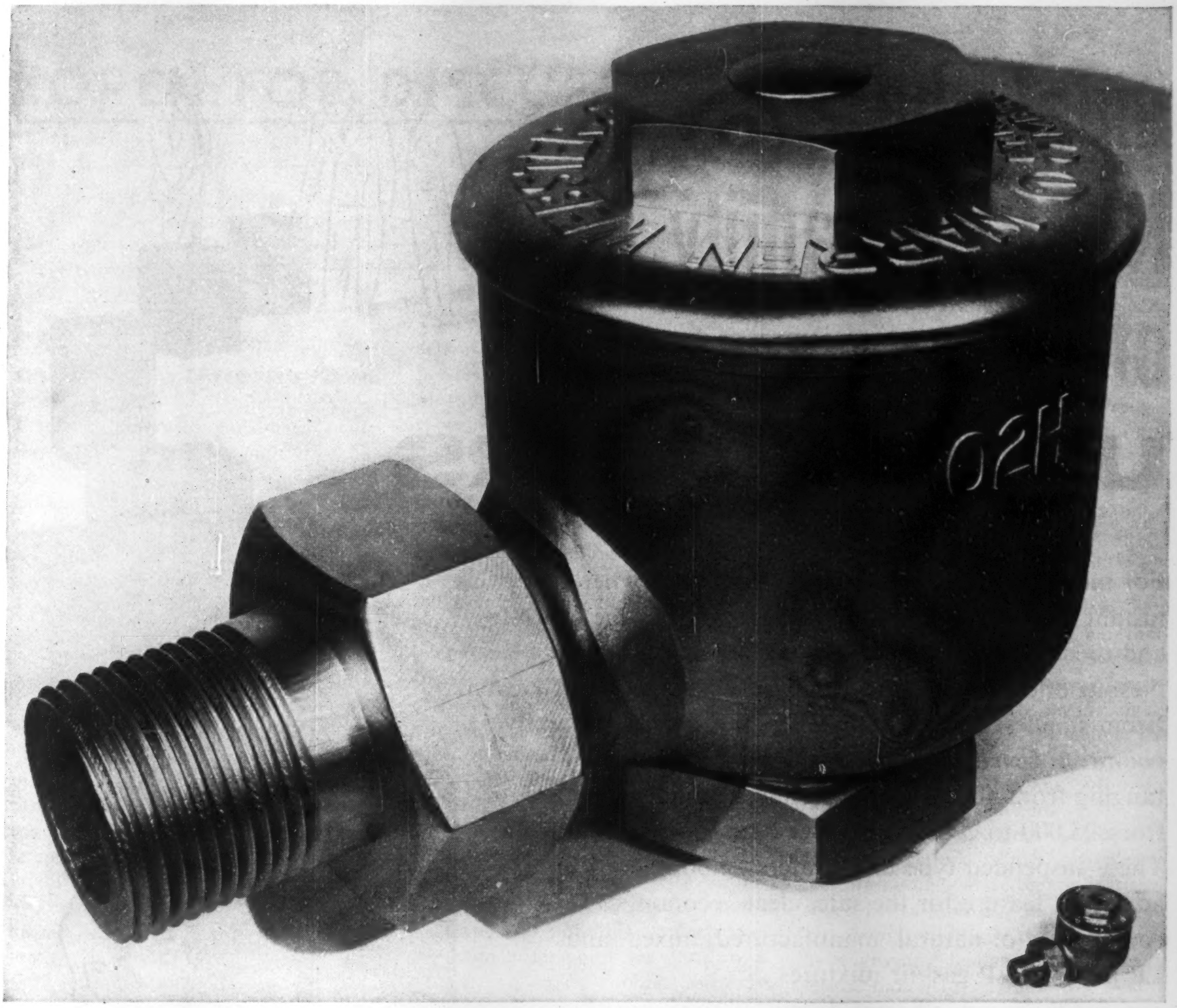
Keeney Announces New Officers

. . . publishing firm elects

WITH THE creation of the office of chairman of the board, which Publisher Frank P. Keeney assumed last month, the Keeney Publishing Co., publisher of Heating, Piping & Air Conditioning and the American Artisan, announced the election of Chas. E. Price as president and treasurer of the company. Mr. Price has been secretary, treasurer and general manager for a number of years.

Robert A. Jack, in charge of advertising in the central eastern territory for both magazines, became vice president of the company. Wallace J. Osborn, head of the eastern office of the company, continues as vice president. C. M. Burnam, Jr., editorial director, was elected secretary.

Each of these officers has been with the Keeney Publishing Co. continuously since its formation in 1933, and prior to that with the two magazines which came under the Keeney company's ownership at that time.



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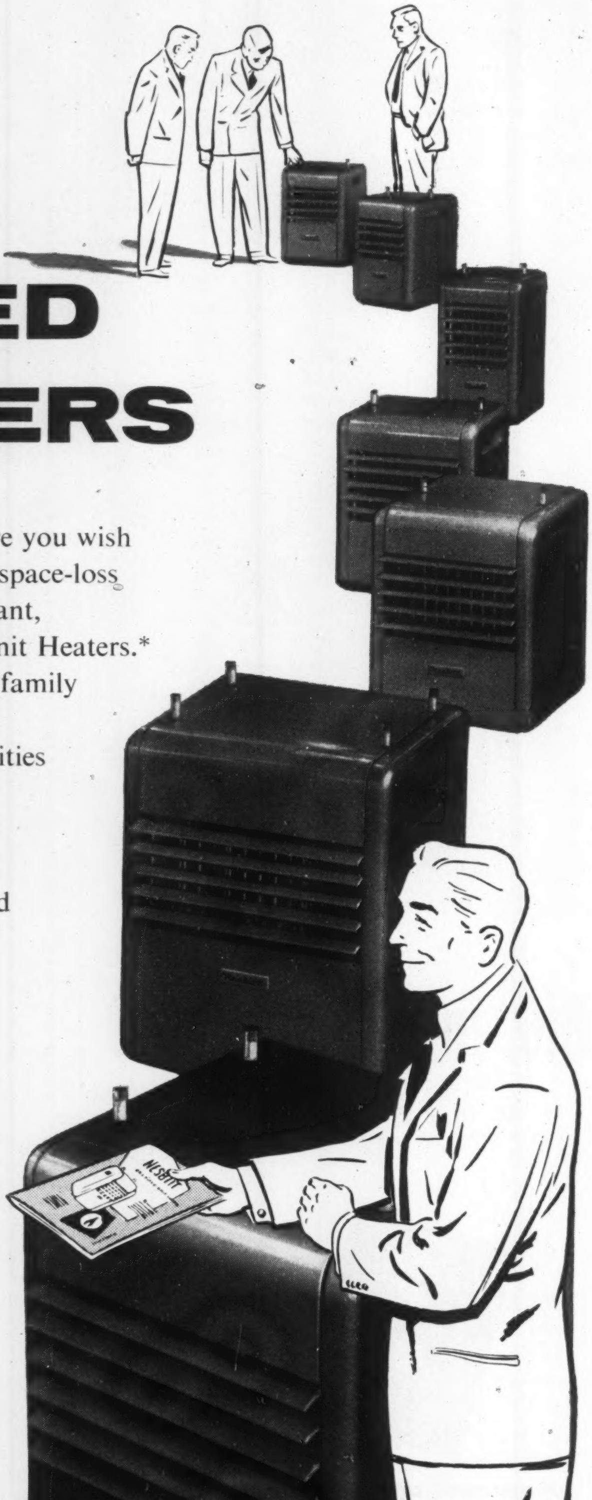

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S. W. MILLER —

"Are Night Controls and Cooling Necessary?"

I HAVE READ with considerable interest the first article on How to Control Unit Ventilators in School Buildings, by Harold W. Alyea, in the October HPAC. It is an informative presentation of a subject which is not as well understood as it might be — the job that a unit ventilator and its controls must do in a school classroom.

Mr. Alyea discusses two points which I believe warrant further consideration. The first is in regard to the cooling cycle. He says that in present day classrooms, the major problem is one of cooling, even during periods of relatively low outdoor temperatures. Without defining "relatively low", he cites an example of a classroom in which cooling is required at outdoor temperatures as low as 15 or 20 F.

The implication that cooling can occur at temperatures such as these, except in the rarest and most unusual cases, is entirely unreasonable. Moreover, it is not borne out by experimental evidence. Cooling, while it is certainly an important function of any successful unit ventilator, cannot be described as a *major* problem in cold weather. As a matter of fact, the requirement for cooling is a function of outdoor temperature and diminishes rapidly as outdoor temperature approaches freezing or below.

The following table summarizes data on cooling that was obtained in research studies conducted in normal occupied classrooms in Philadelphia last winter. This data shows the average number of hours during the school day when cooling was required in a north (non-sun exposed) and a south (directly-sun exposed) classroom for various outdoor temperatures and sun conditions. These figures are the numerical average of daily data obtained in 3½ months of continuous testing.

AVERAGE NUMBER of school hours daily when cooling was required — 6½ possible

Average Outdoor Temp, F	South Room Sunny	South Room Cloudy	North Room Sunny	North Room Cloudy
Below 30	0	0	0	0
30 - 40	1½	½	0	0
40 - 50	2½	2	½	½
50 - 60	4½	4	3½	3½

Note that cooling was *never* required when outdoor temperatures fell below 30 F, and was required comparatively *rarely* when outdoor temperatures were as high as 40 F. In fact, cooling was not a major problem — it did not occur during the major portion of the school day even in sunny rooms — in these classrooms even in weather up to 50 F.

It is possible that cooling might be required in classrooms of unusual design — for instance, with a unilateral clerestory window — under sun exposed conditions at much lower outdoor temperatures but, in a normal classroom, cooling certainly is not a *major* problem with outdoor temperatures of freezing or below. Furthermore, there is some question as to whether it will ever be required at outside temperatures of 15 F in a classroom of conventional design.

Cooling is a vital part of the job which a unit ventilator must do, but at the same time, heating, ventilating and some measure of protection against the effects of cold surfaces are equally necessary for classroom comfort. In my opinion, their importance far outweighs that of cooling the classroom in cold weather.

Mr. Alyea devotes a large portion of this article to a discussion of night controls — their operation and uses, with special emphasis on dual control systems with individual day-night switches.

Night controls are those which automatically maintain a predetermined temperature in a school building during unoccupied periods. Dual controls are one form of night controls and require a dual thermostat — two thermostats in one case, one for day and one for night — plus one of the several varieties of switching mechanisms available for their operation. Dual thermostats with individual day-night switches allow individual rooms to be changed from night to day control (over-riding the system control) by pushing a button on the room thermostat.

There are many forms of night control. In its simplest form, a single night thermostat may be located in a cold room and arranged to operate the unit ventilator fans throughout the building when heat is required. Or, several such thermostats may be used, one for each of several zones. There are many other variations, each progressively more complex, until ultimately the dual thermostat system with individual day-night switches and automatic clock control is reached.

Each of these systems performs a useful function. Each provides a certain number of automatic features. Each is desirable and nice to have in a school building. However, there is a growing tendency among engineers today to examine the whole question of unit ventilator controls in an entirely new light. They are asking themselves if it is necessary rather than if it is desirable. Also, they are asking what can be done to simplify and reduce the number of controls required, rather than add to them.

The reasons for this new approach are apparent. Each of the night control systems, as more automatic features are added, grows progressively more complex, requiring the addition of pneumatic-electric and electro-pneumatic switches, relays, additional thermostatic elements, more pneumatic lines and more electric wiring. All of this extra equipment is added to a control system which in its very simplest form is already fairly complex.

This trend of thinking has brought the entire question of night controls for unit ventilators under very close scrutiny. Does the anticipated use of school rooms for night activities justify the additional complexity, maintenance and initial expenditure necessary for most of these forms of automatic night control? Is the projected percentage of hours the classroom will be used for night occupancy in any kind of proportion to the percentage of initial control expenditure required? Is there really much *more* economy of operation in a dual control system, with individual thermostat switches, than there would be in a system in which there were no individual day-night controls?

These are questions thoughtful designers are asking themselves. With today's high building costs, the only systems in which the more elaborate controls are justified are those in which these controls will actually pay for themselves in operating economies. Moreover, careful advance planning of the projected community needs is essential to the attainment of these economies. These controls will pay for themselves only if they are installed in spaces where they will be used to their fullest extent. Careful examination of the merits of each particular installation is desirable before such control systems are specified.—S. W. MILLER, Development Engineer, John J. Nesbitt, Inc.

THE AUTHOR REPLIES —

THE SUBJECT of unit ventilators and their control is too broad and has too many ramifications to cover completely in a few brief articles. Mr. Miller's comments bring out some points not covered in the first article, in the interest of brevity, but with which I am happy to agree.

I cannot agree, however, when Mr. Miller questions the need for cooling at "relatively low outdoor temperatures" of 15 or 20 F. A need for cooling exists whenever the space temperature exceeds the desired level without cooling it. If we do not accept that definition, we are not providing temperature control. Mr. Miller cites tests conducted in a Philadelphia school showing that cooling was not needed at outdoor temperatures below 30 F. I do not doubt these tests, and I am sure that many other schools would show the same results. However, from personal observation and from data published by others, I am just as sure that an equal number of schools, especially those of modern construction with large glass areas, will show a need for cooling at outdoor temperatures which are as low as 15 or 20 F.

I would like to cite the article Demonstration School published in Architectural Forum in May 1952, as an example. The charts on page 118 — for March 6 — show that rooms with both east and south exposures required cooling at 9:00 a.m. when the outdoor temperature was approximately 20 F. In fact, both of these rooms required cooling all day while the outdoor temperature rose gradually to about 35 F at 3:00 p.m.

Similar charts for March 4, which were not published in the above mentioned article, show the south room requiring cooling all day while the outdoor temperature gradually rose from 14 F at 9:00 a.m. to 20 F at 4:00 p.m. The east room required cooling until about noon.

Mr. Miller states that "the requirement for cooling is a function of outdoor temperature". This is true as far as it goes, but surely he does not ask us to ignore the large internal heat gains in a classroom which are equally important in determining the need for cooling. It might be better to say that the need for cooling exists whenever the heat loss of the room is less than the uncontrollable heat gains from solar radiation, occupants, lights and other sources.

The problem of night controls for unit ventilators has many solutions, and I will agree with Mr. Miller that careful consideration of many factors is necessary in selecting the method best suited to accomplish the desired results—consistent with economy of operation and reasonable first cost.

My article pointed out that in mild and moderately severe climates, night controls usually are not necessary. In severe climates — and I would include those areas where the design temperature is zero or below — common practice is to install dual thermostats. This is about the most economical method of obtaining night control, provided the unit fans are shut off at night. Since the control piping is the same as for a single temperature system, the only changes involve the substitution of dual for single thermostats, and the addition of a day-night switch at some central point.

The complications in night control arrangements arrived with the need for intermittent fan operation at night. This, in turn, is the result of omitting auxiliary radiation. It is the unit ventilator representatives, engineers, and others responsible for the design of the heating system, not the control man, who omit the radiation.

A fact which Mr. Miller and many others overlook is that the saving in cost of radiation, piping, labor and controls resulting from the omission of the auxiliary radiators or convectors should be deducted from the increase in control cost due to intermittent fan operation at night. If this does not result in a net overall saving, then the omission of the auxiliary radiation makes no sense, and it would be better to go back to the former arrangement where the unit ventilator operating at night as a convector, plus the auxiliary radiation, could carry the night load.

Since night intermittent cycles apparently are here to stay, a number of ways of accomplishing this have been devised. These vary all the way from a single night thermostat to control the entire building or a zone of the building, to arrangements providing individual control in each room. I wish to add my voice to that of Mr. Miller in advocating a careful analysis of each installation so that not only the control system but the entire installation will be fitted to the requirements of the job. — HAROLD W. ALYEA, Chief Field Engineer, Johnson Service Co.

NORMAN E. BUETER —

"Is Job Followed Up? — That's Good Advice"

I HAVE READ the article Promoting the Growth of Air Conditioning, by Arthur J. Hess, in the January HPAC, with a great deal of interest.

The last sentence of the paragraph headed Is the Job Followed Up? is, in my opinion, the best suggestion for the industry.

In my opinion, it is not only necessary to wage a public educational campaign but a campaign addressed to the architects, as well. The architects must be sold on the idea of paying the engineers for complete supervision, for in no other way will they be assured of a successful installation and full assurance of an enforced specification.—NORMAN E. BUETER, Consulting Engineer.

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At top right, Mr. R. W. Hardy holds a preformed radiant panel heating coil assisted by Mr. Harry Smith who has a prefabricated distribution manifold in his hand. Says Mr. Smith, "One answer to keeping radiant panel heating costs down is prefabrication. That's why we prefer Revere Copper Water Tube: It is ideally suited to preforming and the techniques used to install radiant panel heating."

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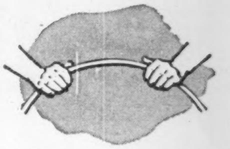


EASY TO BEND

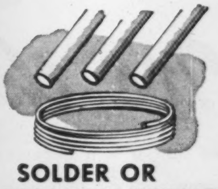
Saves Time

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions.

HANDY LENGTHS

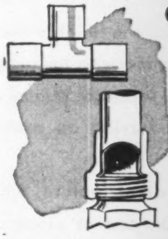
Save Fittings . . . Labor

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.



SOLDER OR COMPRESSION FITTINGS

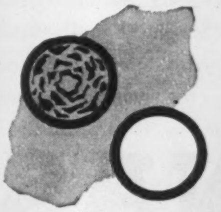
Need Less Work Room . . . Save Metal



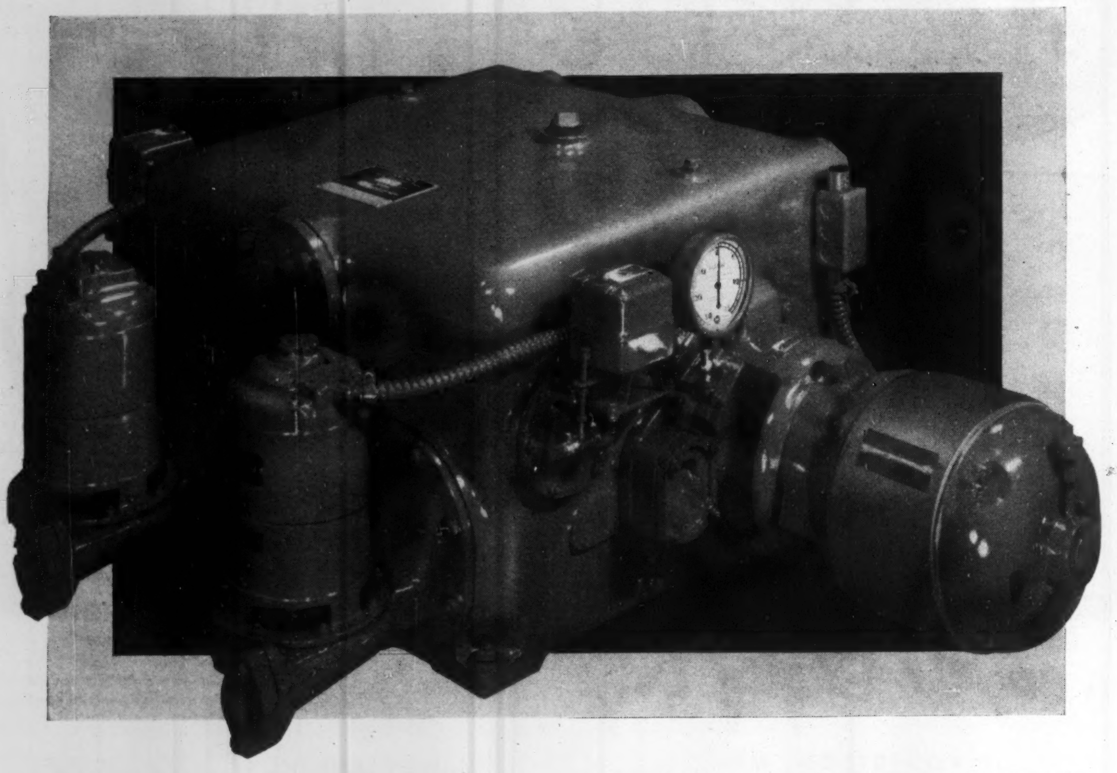
No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.



THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- ✓ **Increased air capacity induces rapid system response without wasteful overheating.**
- ✓ **Separate air and water pumps individually selected to meet actual job requirements.**
- ✓ **Control system that operates individual pumps only when needed.**
- ✓ **Flexibility permitting addition of radiation without changing basic pump installation.**
- ✓ **Low, low, return line connection.**

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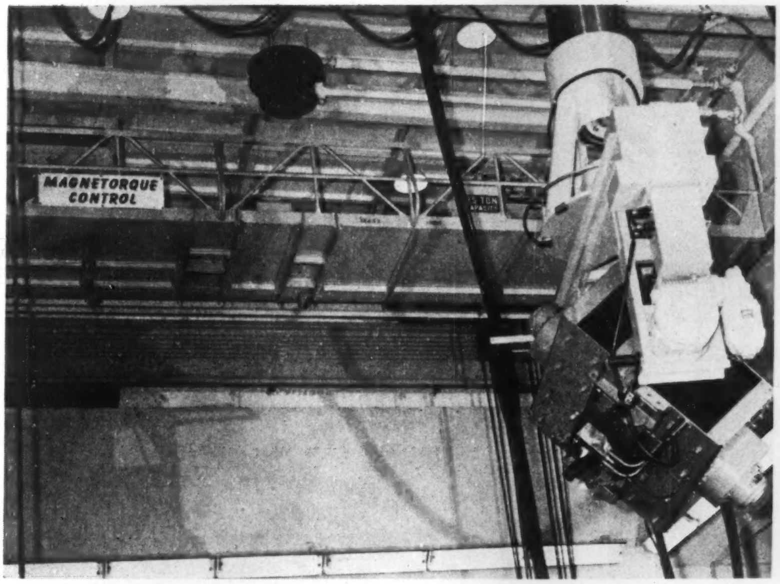
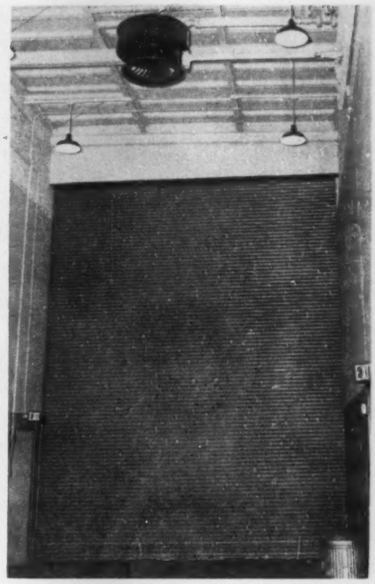


THE BUILDING has 6 ft thick walls to shield personnel from radiation damage from large X-ray machine at right. Unit heater (at center top of photo just ahead of traveling crane) heats working areas by sending down 100 percent outside tempered air introduced at ceiling level through registers



PROJECTION TYPE unit heater blankets this large doorway to the betatron laboratory, preventing cold blasts from entering when door is opened

Walls Are 6 Ft Thick

. . . at Allis-Chalmers betatron laboratory building, constructed to protect personnel in adjacent areas against radiation. This complicated the heating and ventilating design. Such problems may well become commonplace as industrial uses of nuclear power and tracer products grow

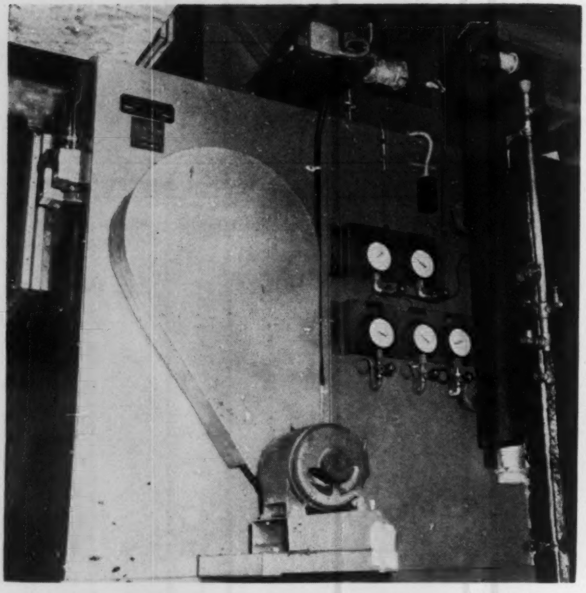
By Jack Williams

Engineer, The Trane Co.

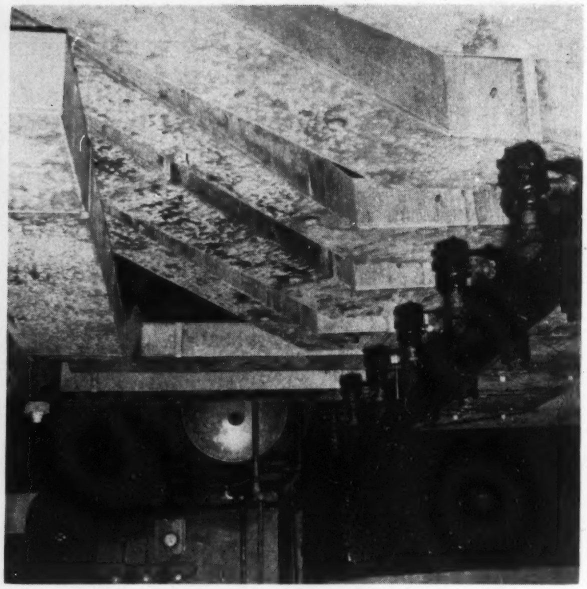
HOW DO YOU GET 100 percent ventilation air into a building with walls 6 ft thick — without piercing the walls with ductwork? That was the problem faced by the Allis-Chalmers Mfg. Co.'s buildings and properties department when they designed the heating and ventilating system for their new betatron laboratory building at Milwaukee.

Manufactured by Allis-Chalmers, the betatron is a huge X-ray machine used to detect flaws in steel castings or other steel structures up to a depth of 24 in. The betatron thus permits detection and repair of flaws in expensive, complex structures before further machining is done.

The building housing the betatron consists of the betatron room proper, associated offices and a darkroom laboratory. The betatron room, large enough to accommodate a full-sized railroad car or a large bridge crane, is 39 ft high. The walls — of reinforced concrete and steel — are 6 ft thick up to 20 ft to shield personnel working in areas adjacent to the building from betatron radiation.



ONE OF THE multi-zone heating and ventilating units used to supply tempered, filtered outside air to registers just under the ceiling level in the betatron laboratory



DUCTWORK off the plenum from the unit distributes outside air to ventilate offices and laboratories. Each duct has booster coils; note float and thermostatic steam traps on return line under ducts

Two Complications

Heating and ventilating the betatron room was a problem complicated by two factors: (1) 100 percent ventilation air must be supplied at all times the room is in use, and (2) ductwork must not pierce the 6 ft thick walls because it would allow radiation leakage.

Further complications arose due to the height of the building. It was found that the air handling system could terminate with a register located just under the roof but above the 6 ft thick wall. As it was not practical to supply air through a high sidewall grille at a velocity that would get it down to floor level, projection type unit heaters with louver cone diffusers were installed to circulate incoming air throughout the room. By placing the unit heaters just below the ceiling, plenty of clearance is allowed for the traveling crane. The louver cone diffusers on the unit heaters increase the effective "distance-of-throw" about 60 percent.

Thus, tempered air delivered by the air handling system at ceiling level is picked up by the unit heaters and dispersed throughout the working zone. When heat is required, primary ventilation air is tempered by heating coils in the air handling unit and further heated by the unit heaters.

Steam — reduced to 5 psi — is fed to all heating coils and unit heaters through a two pipe, low pressure piping system. All condensate is returned by gravity to a condensation pump and from there to the main boilers.

Ventilation air requirements for the betatron room are met by a 10,220 cfm factory assembled unit consisting of face and bypass dampers and heating coils of the steam distributing type. The unit handles 100 percent outside air.

The office heating and ventilating system is in a penthouse over the office section, along with the betatron room heating and ventilating unit. The office system includes a similar unit and seven booster coils, one for each office zone.

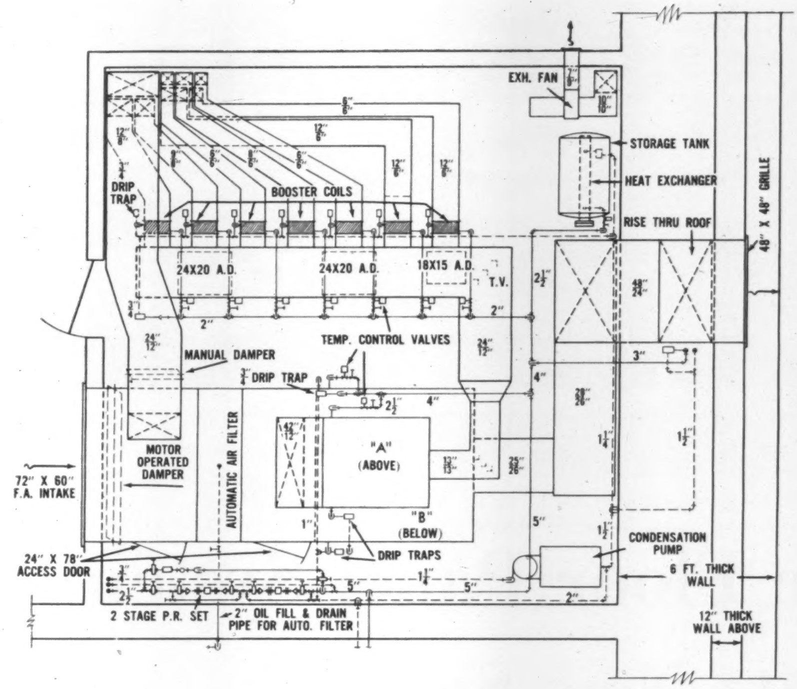
Interesting Control Set-Up

The control set-up for the betatron room and the office system is interesting. The unit heaters are controlled by three dual type thermostats that regulate modulating valves on the steam supply to the units. On the heating cycle, the unit heaters are fed steam as required to maintain inside design conditions. During unoccupied periods, one of the unit heaters operates as a pilot; the others cut in as necessary to hold reduced temperatures.

The heating and ventilating unit for the betatron room is controlled by a pneumatic damper motor which automatically opens the outside air damper when the unit is started. It also opens the damper to an exhaust unit on the betatron room roof. A thermostat in the fan discharge operates the face and bypass damper motor which is provided with an auxiliary switch. This switch, in turn, closes the coil supply when the face damper is 100 percent closed. A positive acting thermostat in the outside air intake opens the steam valve wide whenever the outside temperature goes below freezing.

In addition, an extra freeze protection thermostat automatically stops the unit's fan when there is danger of freezing. The steam distributing coils are designed to reduce danger of coil freeze-up by distributing steam evenly throughout the coil and allowing discharge of condensate as fast as it forms.

The office heating and ventilating control system is relatively standard. The booster coil in each duct is controlled by a thermostat in each



THIS PLAN view of the equipment room shows the heating and ventilating equipment serving the building. Letters "A" and "B" indicate locations of multi-zone heating and ventilating units

office zone. A direct acting thermostat controls a valve on the steam supply to the unit's coil to maintain design air temperature to the distributing plenum. A freeze protection thermostat stops the fan motor when danger of freezing occurs. The fan, controlled by one of the booster coil thermostats, is also set to run intermittently as required at night by a switching arrangement to maintain reduced night temperature. The face damper is closed at all times when the fan is not running. Outside or return air dampers are not installed in the heating and ventilating unit for the office area.

Both the office and X-ray systems are controlled by means of one program clock to provide any desired program of operation. A switch is arranged to bypass the clock if desired. All outside air to both the units is filtered through automatic, self-cleaning filters.

May Become Commonplace

The heating and ventilating system was designed by the Allis-Chalmers buildings and properties department under the direction of Carl E. Meyer. It was installed by Wenzel & Henoch Co.

This unusual problem of heating and ventilating a building which has thick walls may well become commonplace in the foreseeable future, when radiation shielding becomes necessary with increased industrial use of nuclear power and tracer products. The system designed by Allis-Chalmers to meet this problem is proving to be both effective and economical.

New Highs for Fourth Consecutive Year

FOR THE FOURTH consecutive fiscal year, Carrier Corp., a leading air conditioning and refrigeration equipment manufacturer, established new high records in earnings, completed sales and orders booked, according to its annual report mailed to stockholders last month.

Net profit for the 12 months ended October 31, 1953, was $6,107,134. In the preceding fiscal year the corporation earned $4,522,512.

During fiscal 1953 Carrier's completed sales totaled $164,437,530 and new orders were booked in the amount of $176,078,143. The corresponding figures for the preceding period were $107,700,702 and $103,971, 261, respectively.

On October 31, 1953, the corporation had unfilled orders on its books amounting to approximately $110,000,000 as compared with some $95,000,000 a year earlier. Exclusive of major defense business, the corresponding backlog figures were $38,516,367 and $26,875,754.

Commenting on 1953 results, Cloud Wampler, president, emphasized not only the gains made by Carrier, but by the air conditioning industry as a whole. He also stated that during the year the corporation encountered numerous supply and production problems which tended to limit both volume and profit margins.

Regarding 1954, he expressed the opinion that the air conditioning industry would do well volume-wise, but that earnings might be adversely affected by the intensely competitive conditions that are already apparent. In this connection, he pointed out the entry of many new companies into the field and the stepped-up activities of established concerns.

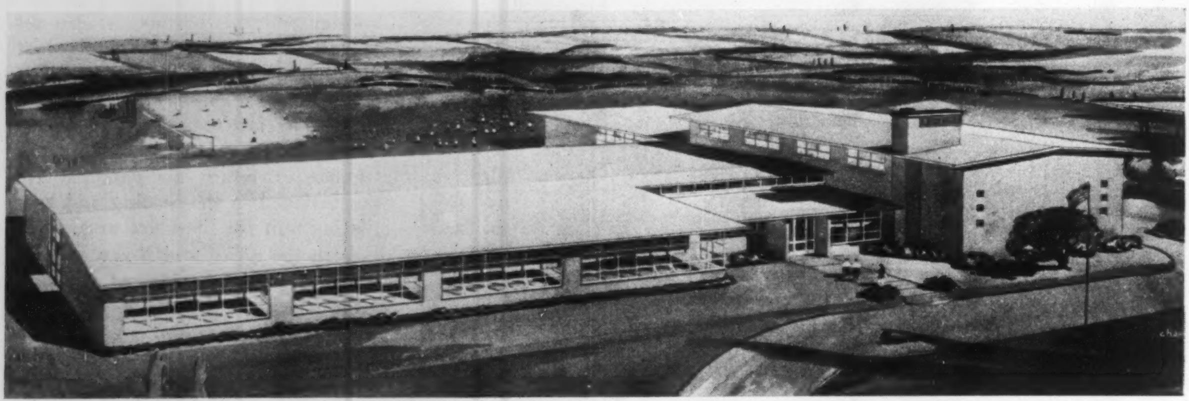
Mr. Wampler stated further that although the corporation will do substantially less defense business this year than last, the decrease should be at least offset by gains in normal production and sales, assuming reasonably favorable general business conditions.

Building Firms Lead in Business Growth

. . . more contractors

THE NUMBER of business firms in the U.S. reached a new record in mid-1953, according to a Department of Commerce report. The contract construction industry led the way, according to the figures, with an increase from 414,000 firms in mid-1952 to 433,800 last year.

There were almost 4¼ million businesses in operation the middle of last year, compared with 4,175,400 a year earlier and 3,964,700 at mid-1948.



THE NEW elementary school at Manchester, Mo. has a floor panel heating system which uses 15,000 ft of copper tubing

Four Zone Floor Panel System Heats New School

By James F. Redding

THE NEW Manchester elementary school near St. Louis is but one of a number of modern schools that have been built in Missouri recently with floor panels throughout the buildings. More than 15,000 ft of copper tubing — embedded in the concrete floor slab — is used in serving the eight classrooms, kindergarten, auditorium and cafeteria and attached kitchen.

The school building occupies a total floor area of about 17,600 sq ft. The overall dimensions of the building are 223 x 79 ft which is comprised of the main section that is 175 x 79 ft and the attached auditorium, which is 48 x 79 ft. All of the classrooms are unusual in that they are square — 28 x 28 ft.

In keeping with the modern design for schools — especially the consolidated rural schools where fire protection is sparse — the structure is one story and of fireproof construction, consisting of structural steel and brick. The roof is of metal decking over bar joists with one inch of rigid insulation over the decking. Large glass areas are incorporated into the structure and present a heating problem because of the high heat loss.

System Has Four Zones

The floor panel type of heating system was selected in order to be sure floors would be warm throughout the building. The system has four zones, and provision has been included for adding a fifth zone when a proposed addition to the building is constructed later. Hard copper water tube — type L and $\frac{5}{8}$ in. in diameter — is used for the coils that are spaced 12 in. on centers.

Individual 20 ft lengths of the tube were prepared on a bending machine to the proper specification and position in the planned layout. The coils were then bundled and delivered to the installation site. Detailed directions accompanied each bundle of coils and the installation was performed by pipefitters on the job.

The main lines are $1\frac{3}{8}$ in. in diameter for three zones and $1\frac{5}{8}$ in. in diameter for the other — the zone that serves the auditorium. The main sizes and capacities for the four zones together with the calculated heat losses for each are given in the accompanying table. Each

DESIGN AND INSTALLATION data for Manchester elementary school

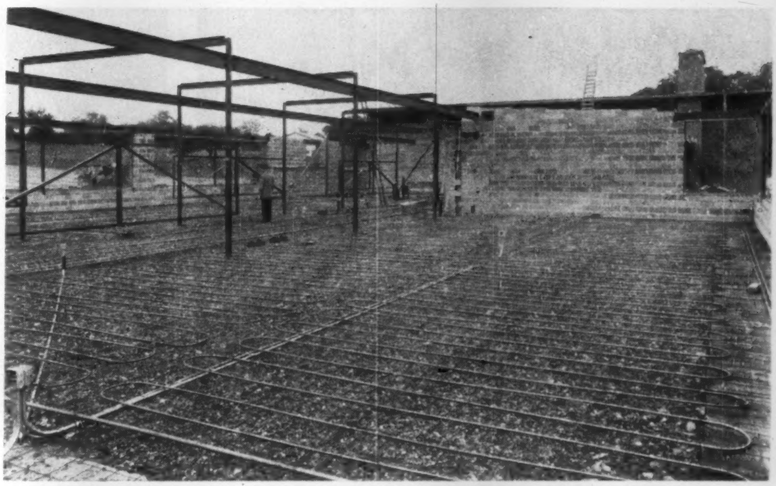
Zone	Heat loss, Btu per hr	Water flow rate, gpm	Main size in.	Total heat output of each zone, Btu per hr	Floor area, sq ft	Heat output required, Btu per hr per sq ft
No. 1	150,000	15	$1\frac{3}{8}$	180,000	4420	34
No. 2	135,000	14	$1\frac{3}{8}$	180,000	3870	35
No. 3	182,000	19	$1\frac{5}{8}$	280,000	4170	44
No. 4	154,000	16	$1\frac{3}{8}$	180,000	5140	30
No. 5 (future)	—	—	$1\frac{5}{8}$	—	—	—
Total	621,000				17,600	

zone is divided into separate circuits with individual controls.

Coils Laid at One Time

The coils were placed and joined on a concrete wire reinforcing mesh which is over a 6 in. fill of washed gravel. The concrete slab — 4 in. thick — was then poured over the coils and wire mesh. As the outside frame of the building was completed before partitioning was begun, the heating contractor was able to lay the entire floor pattern of coils at one time. The space between the outside walls and the heating panels is filled with insulating concrete — 2 in. thick — to prevent excessive heat losses at the edges.

It is estimated that the new structure, complete with the floor panel heating system, cost only about $8.55 per sq ft.



THE COILS were placed and joined on wire reinforcing mesh which is over a layer of washed gravel

The heating system was designed and installed by William J. Bagley, engineer and president of Bagley & Co., Inc., heating engineers and contractors of Robertson, Mo. The architect is Charles W. Lorenz, and the building was erected by Juengel Construction Co., both of Kirkwood, Mo.

Air Conditioning Office Buildings Subject of Lectures

Modern methods for air conditioning large office buildings will be discussed in detail during the first annual Mario C. Giannini memorial lectures to be given on Wednesday evenings at New York University from March 17 through April 7.

Conducted by NYU's division of general education in cooperation with the university's college of engineering and the New York chapter of the American Society of Heating and Ventilating Engineers, the lectures honor the late Associate Professor Giannini, formerly assistant dean of the college and a specialist in air conditioning.

Dean Paul A. McGhee of the division has announced that six experts who are concerned with air conditioning from financial and engineering viewpoints will speak during the 1954 series, entitled Recent Developments in Air Conditioning.

Topics to be covered include central duct systems, unitary and perimeter systems, panel cooling combined with air distribution systems, design problems, the owner's viewpoint, and the future of air conditioning.

The lecturers are Peter B. Gordon, Wolff and Munier, Inc.; F. H. Faust, General Electric Co.; Walter A. Grant, Carrier Corp.; Alfred L. Jaros, Jaros, Baum and Bolles; E. L. Schulz, W. Galbreath and Co., Inc.; and John C. Cushman, Cushman and Wakefield, Inc.

The lectures will be given from 8:10 to 9:55 p.m. at the university's Washington Square center. Information on registration can be obtained from the Division of General Education, 3 Washington Square North, New York City.

ASTM Approves New Specifications, Revisions

The American Society for Testing Materials, through its administrative committee on standards, has recently approved many new specifications and significant revisions.

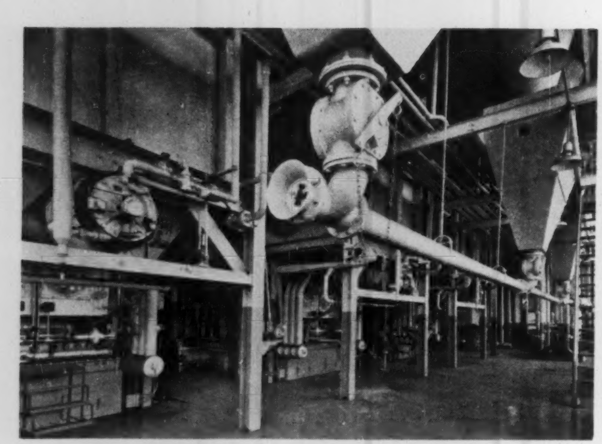
Copies of all new ASTM specifications will be available from ASTM Headquarters, 1916 Race St., Philadelphia 3, at a nominal charge — usually 25 cents each, but slightly higher on standards over 16 pages.

Among the new tentative specifications are the following:

Ferritic Alloy Steel Forged and Bored Pipe for High Temperature Service (A 369 — 53 T)
Carbon and Alloy Steel Forgings for Pressure Vessel Shells (A 372 — 53 T)
Corrosion Resisting Chromium and Chromium-Nickel Steel Welding Rods and Bare Electrodes (A 371 — 53 T)

Among the revisions of tentative specifications are:

Seamless Cold-Drawn Low Carbon Steel Heat Exchanger and Condenser Tubes (A 179 — 53 T)
Alloy Steel Bolting Materials for High Temperature Service (A 193 — 53 T)
Seamless Cold Drawn Intermediate Alloy Steel Heat Exchanger and Condenser Tubes (A 199 — 53 T)
Seamless Intermediate Alloy Steel Still Tubes for Refinery Service (A 200 — 53 T)
Seamless Alloy Steel Boiler, Superheater, and Heat Exchanger Tubes (A 213 — 53 T)
Electric Resistance Welded Heat Exchanger and Condenser Tubes (A 214 — 53 T)
Welded Austenitic Stainless Steel Boiler, Superheater, Heat Exchanger and Condenser Tubes (A 249 — 53 T)
Quenched and Tempered Steel Bolts and Studs with Suitable Nuts and Plain Washers (A 325 — 53 T)
Seamless Ferritic Alloy Steel Pipe for High Temperature Service (A 335 — 53*a* T)
Low Carbon, High Nickel Steel Plate for Pressure Vessels (A 353 — 53 T)
Quenched and Tempered Alloy Steel Bolts and Studs with Suitable Nuts (A 354 — 53 T)
Copper and Copper Alloy Metal Arc Welding Electrodes (B 225 — 53 T)



THAT GOOD maintenance is practiced in the A. B. Dick Co. plant is evident from the appearance of the piping, boilers, fans and allied equipment shown here

PREVENTIVE MAINTENANCE of the 43 heating and ventilating units that are mounted overhead is a regular part of the schedule in the A. B. Dick Co. plant

Preventive Maintenance Is Theme of Conference

"A stitch in time saves nine"

• The total cost of maintenance in American plants has been estimated at $10 billion annually. Hundreds of millions of dollars can be saved if maintenance is planned — instead of doing it on a haphazard basis of repairing only the equipment which breaks down.

Where planning and scheduling procedures have been installed, it has been found that 80 to 90 percent of all maintenance work can be properly planned and scheduled.

Maintenance cannot be looked upon as a necessary evil, nor can it be something that is handled only when you have time.

THE FIFTH ANNUAL Plant Maintenance and Engineering Conference—held recently in Chicago — attracted over 3000 plant engineers, maintenance executives and other plant operating personnel from the U. S. and several foreign countries. In conjunction with the conference, an exposition was held at the International Amphitheater where over 20,000 were in attendance. The Chicago location proved to be so successful that the conference and exposition will be repeated there next year, from January 24th to the 27th.

The conference provided for as many small group gatherings as possible. There were 20 round table discussions — each with two sessions — on such subjects as maintenance of mechanical service equipment, maintenance of power plant equipment, maintenance in chemical plants, maintenance in petroleum refining plants and many others. There were 11 sectional conferences, four of which were repeated and one continued — a total of 16. These sectional conferences covered subjects such as preventive maintenance — pros and cons, corrosion control and prevention, maintenance in hospitals and plant medical departments, and others. Three general sessions were devoted to planning and scheduling maintenance work, maintenance cost control and budgeting, and answers to questions by a panel of 15 experts in various fields and different phases of maintenance.

A few high-lights of this extensive conference — those of particular interest to HPAC's readers — are summarized briefly here.

Planning and Scheduling

George J. Martin, manager of the National Biscuit Co., New York, reviewed the primary requisites in planning and scheduling maintenance work and the establishment of a sound procedure that can be followed.

It is an inevitable conclusion that only through proper planning and control can we expect to realize the maximum benefits of the "preventive maintenance" program, he said. Mistakes in scheduling work assignments and lack of proper follow-up will result in increased downtime, loss of production and unnecessary time and cost on the part of the maintenance crews.

Many executives make cost comparisons of one plant versus another having the same basic operations, and occasionally they fail to recognize the fact that the methods and procedures used by the maintenance organization will either make it outstanding or place it near the bottom of the list. The maintenance organization in any industry can have capable mechanics and ample supervision, but without good planning and scheduling, it cannot achieve maintenance operations on a low cost efficient basis.

With a major portion of all industry using preventive maintenance in part or as a complete program, it has been found that the success of the plant maintenance organization which uses a sound practical planning and scheduling program paid off in greater efficiency and lower costs than those that considered this phase of maintenance only a minor function.

Anything that reduces maintenance efficiency invariably increases depreciation and production costs and plant production methods cannot be termed modern if the equipment is serviced by out-of-date methods. A well organized and efficiently operated maintenance department pays big dividends in any industry.

How Develop Program?

How can we develop a good planning and scheduling program?, he asked.

First, it is desirable to define the functions so that their value can be properly recognized.

Planning can be defined as a systematic organized method for analyzing and laying out work and procedures to utilize men and materials to the greatest advantage.

Scheduling can be defined as determining when each phase of the planned job may be done to fit in with production schedules, receipt of material and available manpower.

Next, it is very desirable to outline the functions and responsibilities of the maintenance personnel. Maintenance organizations, craft supervision and the various craftsmen are usually selected to properly handle the various maintenance functions to maintain the equipment and buildings. The type of industry and size of plant do have a bearing on the setup of the mechanical staff required and there is likely to be some variation in plants in similar industries. However, in general the procedures in all of the plants are along a conventional standard pattern, "To get the most work done in the shortest time possible with existing manpower."

Supervision Important

The plant engineer, having the major responsibility for the supervision of the maintenance operations, should divorce himself completely from routine detailed procedures that can be delegated to persons who will become specialists in a particular maintenance function such as planning and scheduling. He then can channel all of the work orders through this department. In many large plants this phase of maintenance has been handled by the plant engineer, master mechanic or craft foreman; and in other plants it is being done by a combination of several supervisors.

As no two men think alike, such planning and scheduling usually hits snags and creates confusion along with poor maintenance efficiency. Maintenance supervisors can do a much better job in maintenance by confining their ability and attention to the supervision of maintenance crews.

"Let me remind you that a prudent man will not start on a long motor trip without first having his car checked and serviced to insure, as far as possible, against accidents and operating failures. This same logic applies to all mechanical equipment regardless of location. The cost is small when compared with the penalties for neglect."
—O. W. GRAVELEY, works engineer, Electro Metallurgical Co. Div., Union Carbide and Carbon Co., Niagara Falls, N. Y., speaking on the subject of preventive maintenance at the recent Plant Maintenance and Engineering Conference.

Cost Depends Upon Planning

The cost of maintenance jobs depends to a great extent on how thoroughly and efficiently they are planned. There are many good reasons why all maintenance work should be planned and scheduled, he said. To get work done in the sequence that will cause the least amount of interference with production and machine downtime is important. Also, the greatest economy of use of available maintenance man-hours is achieved in this way. Because work orders are estimated, it is relatively simple to distribute the available maintenance manpower to the jobs in priority sequence. When the work of craftsmen is planned at least a day ahead, they are able to work with a minimum amount of delay between jobs.

The planning and scheduling function can be properly accomplished by one person for every 100 craftsmen. This may vary sometimes of course due to the number of work orders being handled. The personnel assigned to this function receive all of the work orders, determine priorities, prepare job estimates, plan the work directly or with the assistance of craft foremen, line up all necessary material for the job, schedule the work, follow-up job progress, collect the time and prepare reports and records.

Work Orders Essential

Good planning starts with the work order, proper and complete description of the work, to permit estimating job time in man-hours. In plants where the production department supervisory personnel make out the work orders, it is very desirable that they properly indicate the work to be done. We have found the use of maintenance manuals and standards very helpful, as they are available to production personnel as well as maintenance personnel, he noted. We also use a mimeographed instruction sheet to guide non-maintenance personnel in properly making out work orders and indicating the priority desired, he said.

Maintenance planning has been greatly aided through the use of work orders as they permit the plant engineer and the planning and scheduling department to review the urgency of all maintenance work, scheduling the important jobs for immediate attention and creating a planned back-log for the maintenance crews in an effort to keep all maintenance overtime down to a minimum and to avoid weekend maintenance operations as much as possible.

In many plants, the maintenance department has found it extremely valuable to have a weekly maintenance conference to review and plan the maintenance program for the weekend and the following week. Conferences of this type are very beneficial, especially in those plants with three shift operations. These meetings are also attended by production department supervisors, a different one attending each week. In this manner, the production supervisor has an opportunity to ask questions pertaining to work orders for his department. This procedure has created a very helpful and harmonious feeling between the two departments.

Equipment Records Required

Equipment records are a primary requirement in setting up a preventive maintenance program as it is necessary to have complete historical data on all of the equipment requiring maintenance. These records, in addition to recording nameplate data, have space for posting the record of all work done on the unit. Periodic examination of the equipment records will indicate whether the unit is economical to operate or needs replacement with a more suitable unit.

An important phase of the preventive maintenance program is the periodic and systematic inspection of all of the equipment on which production depends. The frequency for making these inspections can be staggered to uniformly balance the work load over the entire year. Whether these inspections are scheduled on a chart or by a tickler system using printed inspection forms for specific types of equipment, it is very desirable that the plant engineer or the planning and scheduling department incorporate them in the overall planning and scheduling program.

Mechanical downtime reports are usually recorded in log books or reported on a printed form by the mechanics. A record of all mechanical downtime is important to determine whether the maintenance department is making progress using preventive maintenance procedures or is in need of better maintenance to cover their weak spots. Breakdowns may occur even when using a good sound preventive maintenance program. However, after emergency repairs have been made, the equipment should be permanently repaired under planned and scheduled conditions to prevent a recurrence.

Work Can Be Scheduled

It has been frequently said that all maintenance work can be scheduled. Others feel that only a small percentage can be done on a planned basis. The latter is quite true only in plants that have not installed modern preventive maintenance procedures. Where planning and scheduling procedures have been installed, they have found that 80 to 90 percent of all maintenance work can be properly planned and scheduled. Data for effective planning can be accumulated from equipment records, periodic inspection reports, departmental records, time studies, job analyses, etc. All of this data contributes greatly in getting maximum benefits from maintenance scheduling.

It is desirable to schedule all maintenance work whether the jobs are large or small, urgent or otherwise. A heavy backlog of maintenance jobs is an indication of inefficiency.

Maintenance scheduling should be broken down to indicate the various types of maintenance jobs for which maintenance personnel is required:

1) Routine work such as lubrication, area mechanics, cleaning, etc. can be readily planned and scheduled. Standard procedures have been established to cover all of the work in this group. Area mechanics are used to assist assigned crews when working in that department.

2) Preventive maintenance inspections are made on an assigned schedule basis by area mechanics and occasionally by craftsmen from the central shops — standing work orders are used for charging time expended.

3) Routine assigned maintenance work. All work in this category is done on work order requests. Work is all planned and scheduled and done on an assigned priority basis. Schedules are prepared a day in advance. Weekend work is planned and scheduled at least two days in advance.

4) Periodic equipment overhaul. Schedules for this are determined from preventive maintenance inspection reports and planned six months to a year in advance so as to tie in with production schedules and sales planning. Motors, pumps and compressors are occasionally contracted for overhauling when available manpower is low.

5) Long range capital improvements. Long range planning for capital improvements is frequently done by the engineering department and fitted into maintenance schedules. When the capital improvement is major in scope, it is usually contracted to outside companies.

6) Emergency repair work. Although this type of work cannot be planned, every attempt is made to give it top priority over all other maintenance work. When a breakdown occurs, craftsmen are assigned immediately without normal planning. However, requisitions are prepared as quickly as possible and the regular schedule adjusted on other work in process. We always have craftsmen that are assigned to specific duties that are available for emergencies or breakdowns, he said. Preventive maintenance has been greatly responsible in reducing breakdowns to a minimum.

We assign our excess available maintenance manpower to work in our shops overhauling various types of equipment. This gives us a twofold benefit; reduces peaks and valleys in maintenance scheduling and gives us an available crew for emergencies. The production department does not recognize the failure of machinery as an excuse for delay in production; therefore, we must be prepared for any emergency that may arise, Mr. Martin said.

Since present day management is interested in having an efficient maintenance organization, it requires executive reports to establish budgets, work load charts, equipment downtime reports and comparison of maintenance costs with budgets. If top management approves the setting up of a planning and scheduling department, it can be assured of savings from 10 to 15 percent of the maintenance labor cost by reduction of labor due to good planning and scheduling together with a reduction in overtime.

Costs Difficult to Determine

Maintenance costs are probably the most elusive of all manufacturing accounts. There is a tendency to regard the maintenance department as a kind of standing army. The difficulty of this conception lies in the fact that it is hard to determine just how large the army should be. It is possible to schedule maintenance jobs just as production jobs are scheduled and to have an idea of approximately what is being spent from month to month.

In most plants, work measurement has been the function of the industrial engineering department. However, since the planning and scheduling departments are fully familiar with the job requirements, the crafts required, and the efficiency of the maintenance crews, it seems that they should jointly work with the industrial engineering department on time studies, methods-time-measurement data and estimating. Since incentives in maintenance may have a bearing on incentives used in other departments of a company, it is felt that this phase should be analyzed by the industrial engineering department and reviewed by the plant engineer before being recommended to management, he indicated.

With labor and material costs at an all-time high peak, management is vitally interested in a cost reduction program for maintenance as well as for production as both have a strong bearing on the manufactured product cost. Therefore, every effort should be made to increase your maintenance efficiency and reduce your costs through sound planning and scheduling.

Maintenance in A. B. Dick Plant

The subject of planning and scheduling maintenance work in a plant with 1100 shop employees was covered by F. R. Malmgren, building superintendent, A. B. Dick Co., Chicago. Mr. Malmgren described the facilities of his organization and how he operates. His plant is a relatively new one — all on one floor — except the office building, which is completely air conditioned, and occupies 100,000 sq ft of floor area on two floors.

The factory building, which houses all of the manufacturing facilities and warehousing, is one-story with 40 × 60 ft bays. Parts of this building, as required for process work, are also air conditioned. This factory building, together with the boiler house and several miscellaneous buildings, occupy approximately 533,000 sq ft of floor area. Sixteen hundred persons are employed of which about 1100 are shop people and 500 are office employees.

One of the goals in the design and construction of this plant was to make it as maintenance free as good engineering could provide. This in itself is an incentive to good practices from a maintenance standpoint.

The chief operating engineer, who is in charge of the boiler house and air conditioning equipment, schedules his own maintenance work. He operates on a budget which covers all labor, material, fuel and supplies. This department performs most of its own maintenance work. In the event it cannot handle the project, an order is issued to the maintenance department for additional services.

Coal is the chief fuel, with an annual consumption of about 5000 tons. Gas is burned in the summertime. This arrangement gives an excellent opportunity to schedule maintenance of boilers, and coal and ash handling equipment during the summer months. Gas equipment and controls are serviced during winter months. Fuel consumption is for process work and heat. The plant does not generate its own power.

Process air conditioning is required all year round for some processes. For this purpose, three interconnected refrigeration machines with a combined capacity of 900 tons are available. Therefore, maintenance of these machines can be scheduled during the winter. In the summer, all three machines are required to handle the air conditioning load.

Heating equipment throughout the plant and offices is scheduled for maintenance in the summer, and cooling coils naturally are checked during the winter months.

> **"Maintenance people are like the ancient Chinese doctors. You remember how they worked — instead of charging a fee when a patient became ill, they were paid an annual salary to keep the patient healthy. The more healthy patients the Chinese doctor had, the better off he was."**— J. B. Gibbons, plant engineer, aircraft gas turbine division, General Electric Co., Evendale, Ohio, at the Plant Maintenance and Engineering Conference.

Maintenance Manual Prepared

A maintenance manual is being prepared at the present time which will cover all phases of maintenance on physical properties. Each member of the maintenance organization will receive a copy of this manual to be used as a guide in performing his work.

The intent of this manual is to set up standards and procedures for each type of physical properties, showing not only how it should be maintained, but also what materials to use. Also, the names of the original contractors are listed for reference purposes. However, no attempt is made in this manual to cover each and every type of equipment. Maintenance instructions for individual types of equipment, including those supplied by equipment vendors, are given to the person who must maintain that equipment. Proper use of this manual will eliminate guesswork in the accomplishment of the repairs. It will also set up the standards that must be maintained. A set of maintenance safety rules for each holder of the manual is in the front of the manual, he noted.

In conclusion, proper maintenance is everyone's job. Maintenance cannot be looked upon as a necessary evil, nor can it be something that is handled when you have time. The quality of maintenance is determined by top management and executed by those who work directly with the problem. Good maintenance is repaid in many ways, among them being:

1) Properly maintaining the original investment.

2) Elimination of downtime for production.

3) A good preventive maintenance program reduces replacement costs.

4) High employee morale is maintained throughout the entire organization.

Proper planning cannot be overemphasized — whether it is maintenance or new buildings. It is the first step and must be a part of each succeeding step all down the line.

Maintenance in a Small Plant

Planning and scheduling maintenance work in a plant with 150 shop employees was discussed by C. A. Ralph, plant engineer, Wales-Strippit Corp., North Tonawanda, N. Y. In his organization, Mr. Ralph reported that before any planning or scheduling can be started, a request must be received for work to be done. The request comes from the shop or from the clerk who handles the preventive maintenance records.

The origin of the request may be discussed by breaking the request into two categories.

1) Machine repair and adjustment.
2) Building repair and maintenance.

For the first group, the request will originate with:

1) Foreman of department.
2) Safety committee.
3) Quality control.
4) Superintendent.
5) Tools and methods men.
6) Plant engineer.

For the second group the request will originate with:

1) Superintendent.
2) Plant manager.
3) Plant engineer.
4) Safety committee.

All these request forms go to the plant engineer's office for processing. In the first group, the request must be approved by the following:

1) Superintendent.
2) Department foreman.

This approval is necessary to alert all concerned with the conditions so that safety measures can be taken and plans made to get the production work done as required without use of the equipment in question.

It is at this point that the plant engineer's office must establish a plan to schedule the work from the "maintenance request cards" and also include the "preventive maintenance" work cards.

Scheduling Board Used

His company uses a scheduling board for planning, he said, and this board is split into three sections:

1) Emergency repair.
2) Periodic cleaning and adjustment and replacement of wearing parts.
3) Complete overhaul or major repair, or replacement of units.

On the board, the above categories are split into four parts as follows:

1) Mechanical.
2) Electrical.
3) Building trades.
4) General labor.

These are the tools to work out the problem: 1) The orders for work to be done and 2), a planning chart.

Then, the chart with work to be done is set up using estimated time as the basis for scheduling. This estimate of time can be designated by the maintenance foreman or the plant engineer, and in complicated cases it may require the attention of both. Also, the purchasing department or stockroom must be added to this picture at this point, as material procurement also governs the time at which a job can be started.

Usually, every Thursday all cards are pulled that have a flag for the next week or period and the work orders are written for the following week. Orders are then posted on the scheduling board in conjunction with repair tickets. This may be done several weeks in advance. All this planning depends on the work load and time element.

Equipment Card Is "The Bible"

This machine or equipment card is "the bible" of the equipment as far as history and maintenance is concerned. It tells the following:

1) What equipment is in need of replacement because of large repair costs.

2) If equipment is properly serviced.

3) If certain types of failures are repeating so corrections or alterations can be made or special attention given to the problem.

4) If overhauls are necessary more often. Here again production control can get a clear-cut picture so work can be scheduled to include periodic shutdowns.

5) It tells the plant engineer, when too much lost time occurs due to repetition of the same type of breakdowns, so he will have a sound footing to face management and demand a complete shutdown for proper repairs.

6) Tells whether special action must be taken to obtain new parts, even to the extent of making up new parts at extra cost to stop repeated, short time shut-downs.

7) Tells when a new machine is needed because of service costs.

The one problem a system as described cannot solve is the one where management and production control are short-sighted and refuse to cooperate — even with all facts presented. In most of all cases, the true picture from the card giving overall costs and downtime will be found to be so convincing that management will back the program and stand behind the program when it is properly presented to them.

Maintenance Organization

The following information given by Stuart Whitehead, general superintendent, maintenance and construction department, Calco Chemical Div., American Cyanamid Co., which was given at the conference, indicates the particular importance of piping work in plant maintenance. He said that a careful analysis of their construction needs, based on their previous experience, indicated they should have the following ratios in a construction force of 100 men:

20 Millwrights
26 Pipefitters
8 Welders
7 Electricians
8 Carpenters
4 Riggers
6 Laborers
4 Masons
2 Machinists
4 Sheet metal workers
2 Instrument mechanics
3 Lead burners
6 Painters

He also mentioned that in his industry "the biggest single factor creating maintenance work is corrosion of equipment, pipe lines, facilities, and even buildings. On those pieces of equipment where we are forewarned of failures, test specimens are installed sufficiently far ahead to determine a better material of construction that will reduce the frequency of replacement," he said. "While unfortunately we have no figures that can show us the amount of money we have saved by such equipment improvement, we can see the effects in many ways, not the least of which is the continual reduction of manpower in our lead shop and our sheet metal shop."

Plan for Preventive Maintenance

A COMPLETELY PLANNED procedure for preventive maintenance in a plant with 3000 employees — 400 of whom are in maintenance — was outlined at the recent Plant Maintenance and Engineering Conference by O. W. Graveley, works engineer, Electro Metallurgical Co. Div., Union Carbide and Carbon Co., Niagara Falls, N. Y. The plan is presented here — in outline form.

Maintenance Personnel

A maintenance department should be comprised of a head with sufficient assistance from foremen to adequately supervise work based on location and craft, varying from one foreman to eight hourly men to one foreman and 30 men — with an average of approximately 16. The hourly men should have sufficient skill or ability to perform the work, backed up with a training program to insure present and future requirements.

A preventive maintenance program administrator should be available, with clerks for scheduling, expediting and recording. Duties of this group include:

1 Development and establishment of procedure.

2 Work with maintenance and operating foremen to establish inspection and lubrication schedules.

3 Assist in the formation of maintenance department weekly schedules.

4 Supervise procedures in maintenance department relative to program.

5 Collect and transfer information between master mechanic and department foreman.

6 Check and maintain proper repair order charges.

7 Work with department foremen to set up spare parts carried in stores.

8 Maintain equipment inspection and service records.

9 Coordinate and follow up maintenance cost control.

10 Direct the sending out of "Tickler Sheets" and check on their return.

11 Check effectiveness of maintenance program, recommend procedure changes.

12 Perform other miscellaneous work in conjunction with the maintenance program, such as tabulation of work backlog, records of maintenance, planning and cost analysis.

Maintenance Records

For planning, a good set of records is required. These records should include:

1 Manning table to show the standard crew required for the average of work to be done.

2 Backlog of work history to show whether an increase or decrease of crew is required.

3 Work distribution, to show where concentration is required.

4 Overtime requirements, to determine whether emergencies are occurring too frequently.

5 Equipment record cards, bearing as a file number the cost department's repair order equipment charge number. The information on these cards consists of:

a) Equipment title.
b) Maker
c) Date of purchase and purchase order number.
d) Serial number.
e) Motor requirements.
f) Starting equipment.
g) Use of equipment.
h) Spare parts carried.
i) Lubrication and intervals.
j) Inspection and intervals.
k) When inspections are made and condition by symbol.
l) Repair order data, as and when completed.

This information is placed on cards in a book, made up for each operating department, which includes each major piece of equipment in that department. A copy of this information is also in the maintenance department.

Spare Parts

A survey is made of spare part requirements concurrently with setting up of equipment data cards. Periodic reviews must be made, based on parts delivery changing, use differing or other influencing factors occurring.

Inspection Procedures

Equipment inspections are made by Class A craftsmen, who ordinarily repair the type of equipment involved. These craftsmen use check lists. A copy of the check list, showing the current equipment conditions and recommendations for repairs, is given to the foremen of the operating department and the maintenance department.

Equipment inspections are made on a time or use basis, whichever comes first. Time intervals are set up for inspection of equipment during the earlier equipment investigation to determine condition and use. These intervals vary to meet equipment needs. The use basis is also set up at the time of the original equipment investigation and is reviewed as the use changes.

The time intervals for inspections are set up on "Tickler Sheets" sent out by the maintenance department. These "Tickler Sheets" are reminders to department foremen and the maintenance department that inspections, major repairs, overhauls and other known conditions require attention as indicated.

Building inspections are made on an annual basis by the works engineer's department. The following items are listed on inspection sheets and provisions are made on the forms for inclusion of work estimates:

1) Foundation walls.
2) Columns.
3) Floors.
4) Stairs and aisles.
5) Interior walls.
6) Roof.
7) Exterior walls.
8) Doors.
9) Windows.
10) Fire escapes.
11) Loading platforms.

12) Pipe lines.
13) Smaller buildings.
14) Grounds.
15) Drains and sewers.
16) Lighting.
17) Glazing.
18) Stacks and ventilators.

A copy of the building inspection report is given the occupying department, shortly after the inspection, for budget purposes in the ensuing year.

Job Scheduling

All work other than emergencies is planned by scheduling on a weekly basis; the week runs from Monday to Friday inclusive, and the scheduling is done on Friday for the following week. Emergencies will occur which require the use of men shown on the weekly schedule. To meet this requirement, jobs of secondary importance — from a time standpoint — are included in the schedules. Men may be removed from these secondary jobs without seriously affecting plant operations. Those jobs from which men have been removed for emergencies are rescheduled the following week.

The scheduling is done by the craft foreman involved and a member of the master mechanic's staff. To do this scheduling, it is necessary that the man hour requirements of each job be known. To obtain this information, craft foremen estimate from past performance the man hours.

Cost Control

Each major item of equipment and building must have its own repair order charge number to allow an accurate check of repair costs on individual items. Accurate historical data simplify the problem of budgeting, allow careful consideration when equipment replacements and changes are needed, and point up maintenance department failures and operating department equipment abuses.

When the repair order is used as a basis for cost records, it is written for one repair and one piece of equipment only. Costs accumulated on this basis will also give nature and frequency of repair for future study and action.

Lubrication

Complete schedules of lubrication are prepared under supervision of the maintenance control administrator for each item of equipment. These schedules are in the operating and maintenance departments. Motors and cranes are taken care of by the maintenance department. Other equipment is lubricated either by the maintenance department or the operating department, as determined by the operating department.

Coordination and Cooperation

Preventive maintenance requires the cooperation of all operating departments. Equipment must be made available for inspection or repair on schedule, if operations permit. Operators must be notified in advance if the maintenance department cannot keep its schedule. The operating department foreman takes part in all planning and scheduling in his department.

Preventive maintenance requires trained personnel, constant attention, established routines and records. These have a way of increasing beyond need unless checked occasionally and should be kept to a minimum.

Preventive maintenance — when set up properly — can use tabulating machines to analyze data. We have been using machines for this purpose, and at present they are used on the analysis of the following:

1 Report of completed orders monthly, reported by charge and by department, including estimate of work by hours, actual performance by hours, variation between estimated and actual in hours, and actual expenditures for labor in dollars.

2 Report on dollars and hours expended in each department, by craft and job, monthly.

3 Backlog of work by department and job, weekly.

4 Backlog of work by craft, weekly.

5 Report on jobs other than regular repairs, which contains all information the same as prepared for regular repair jobs, monthly.

We are continuing with the development of the use of tabulating machines for data analysis and shall eventually obtain all our information from this source, Mr. Graveley said.

Central Spray Pond Proposed

. . . for air conditioning water

AT A RECENT meeting of water works officials from several New Jersey municipalities and Worthington Corp. air conditioning experts, plans were discussed for alleviating water shortages in expanding communities. In some New Jersey areas, as well as in other parts of the country, seasonal droughts have presented an acute water problem.

M. M. Lawler, Worthington's vice president in charge of air conditioning, stated that a scheme has been devised that may fit the particular situations faced by builders of large developments in some localities. This scheme involves the use of a spray pond, centrally located in a recreational park area and made attractive with suitable architectural or landscaping treatment. The water could be treated to inhibit corrosion and the system could be drained during the winter. During the hottest weather, it is estimated that only one-tenth of the water normally required for air conditioners utilizing water cooled condensers would have to be purchased from the local water departments, he said.

Rather than have the nearest municipality furnish all the water, the development could have its own recirculating water system, with the piping under the streets along with the sanitary water supply piping. At some central point, designed as a recreation area, a pumping station and a cooling tower or spray pond could be constructed.

Stored Gas Helps Meet Heating Peak

. . . underground reservoir used

CONSUMERS in a five-state area received gas from the underground storage facilities near Kankakee, Ill., for the first time earlier this year, according to the Peoples Gas Light & Coke Co., Chicago. In a 24 hr period, 90 million cu ft of natural gas was pumped from the reservoir and supplied to 10 utilities.

Part of the gas helped to meet an alltime peak in Chicago caused by zero temperatures.

How Air Washers Perform When Cooling

By H. M. Hendrickson
Associate Professor of Mechanical Engineering
University of Washington

• The psychrometric chart provides a convenient medium for graphically showing thermodynamic processes involving air washers. By using the psychrometric chart and the water to air heat balance, the leaving air and water conditions may be closely approximated if the following data concerning the design of the washer is available:

1) The saturating efficiency when the spray water is neither heated nor cooled.

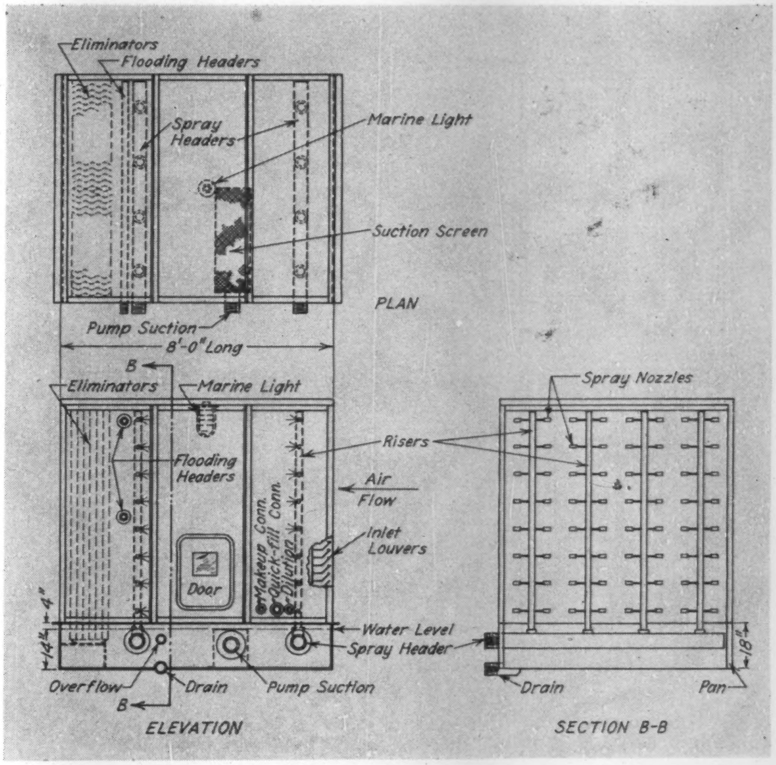
2) The performance factor when cooling and dehumidifying.

3) The spray nozzle performance as related to water pressure and orifice size.

Related to the above factors are the air velocity, length of air travel, number of spray banks and direction of water spray with respect to air travel. In general, the air velocity should be 500 fpm for air conditioning applications.

The nozzle pressure should be from 20 to 35 psi, with small orifices delivering from 1 to 2½ gpm at these pressures. For evaporative cooling, the water quantity should be about 2 gpm per sq ft of washer face area per spray bank. For the most efficient design when cooling and dehumidifying larger water quantities, in the region of 3 to 5 gpm per sq ft of washer face area per spray bank, should be used. The maximum water quantity that it is economical to use when cooling and dehumidifying is 10 gpm total per sq ft of washer face area — 5 gpm per sq ft per spray bank if two spray banks are used. Up to 10 gpm per sq ft in a single spray bank is sometimes used in special washers having cooling coils directly in the spray chamber.

Ordinary air washers do not produce saturated air leaving when operated on a cooling cycle, although a high degree of saturation may be obtained with proper design under controlled operating conditions. When cooling and dehumidifying, the degree of saturation obtainable depends upon the washer design and the entering air conditions, both dry bulb and wet bulb temperatures.

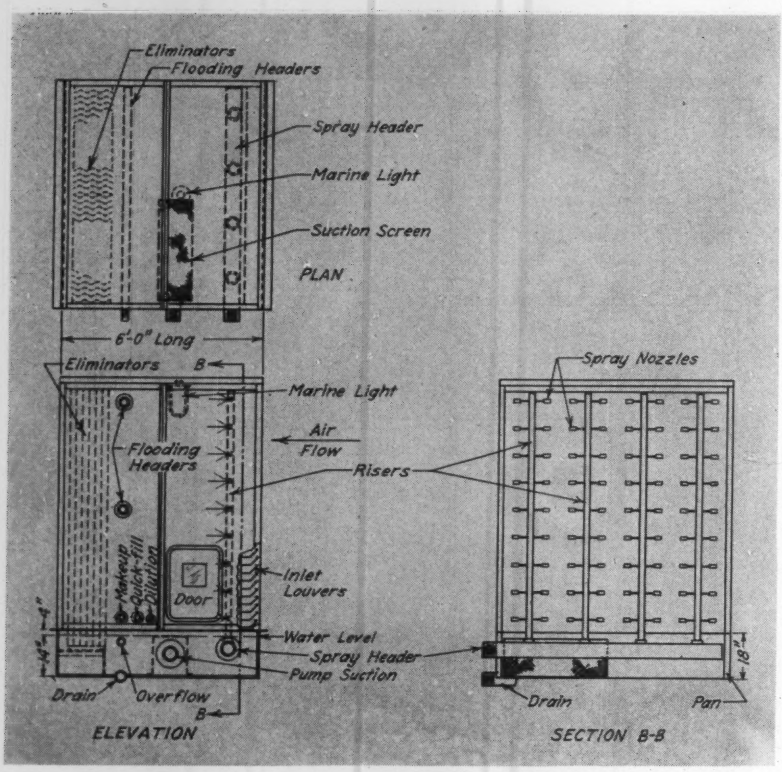

Eliminators
Flooding Headers
Spray Headers
Marine Light
Suction Screen
PLAN
Pump Suction
8'-0" Long
B
Eliminators
Marine Light
Flooding Headers
Risers
Air Flow
Inlet Louvers
Makeup Conn.
Quick-fill Conn.
Dilution
Door
4"
14"
Water Level
Spray Header
Overflow
Drain
B
Pump Suction
ELEVATION
Spray Nozzles
18"
Drain
Pan
SECTION B-B

1 ONE OF THE COMMON types of air washers for air conditioning is the two spray bank air washer

Air washers may be used as central station air conditioners, especially for large installations. They clean and, to some extent, purify the supply air, and they can be used for humidifying and dehumidifying as well as for cooling. When provided with dew point control, they will produce very close humidity conditions. In dry climates and during intermediate seasons, they will provide evaporative cooling, and when chilled water is supplied to the sprays, dehumidification as well as cooling may be accomplished.

Factors Involved Discussed

This article discusses the factors involved in the cooling process only,



2 ANOTHER COMMON type of air washer for air conditioning is the one spray bank air washer

which may be any of the following:

1) Evaporative or adiabatic cooling (no change in total heat content or wet bulb temperature of the air).

2) Sensible cooling with moderate humidification (dew point temperature of air raised but dry bulb and wet bulb lowered).

3) Sensible cooling only (dew point temperature of air constant but dry bulb and wet bulb lowered).

4) Sensible cooling with dehumidification (dry bulb, wet bulb and dew point temperatures all lowered).

In general, when the spray water temperature is lower than the dry bulb temperature of the incoming air, the air will be cooled. When the spray water temperature is lower than the dew point temperature of the incoming air, the air will be both cooled and dehumidified. The lower the spray water temperature, the greater will be the condensation of moisture from the air and the greater will be latent heat removal. Figs. 1 and 2 illustrate two of the most common types of air washers for air conditioning work — the 8 ft long double spray bank unit and the 6 ft long single spray bank unit.

The saturating and heat transfer efficiencies of air washers are dependent upon the following main factors:

1) Air velocity.

2) Water to air ratio.

3) Spray nozzle design and pressure — fineness of atomization.

4) Number of spray banks and arrangement of nozzles.

5) Entering air dry bulb and wet bulb temperatures.

6) Entering water temperature and water temperature range.

Range of Operating Conditions

Normal air velocities fall between 400 and 650 fpm, with 450 to 550 fpm recommended unless severe space limitations make the higher velocities necessary. However, the higher air velocities often result in problems with spray carry-over, so they should be avoided in comfort cooling applications. Spray nozzle pressures vary from 15 to 35 psi, with 25 psi about average. The water quantity varies from 2 to 5 gpm per sq ft of face area per spray bank. Small centrifugal nozzles producing a fine spray and handling from 1 to 3½ gpm each are required for high saturating efficiencies.

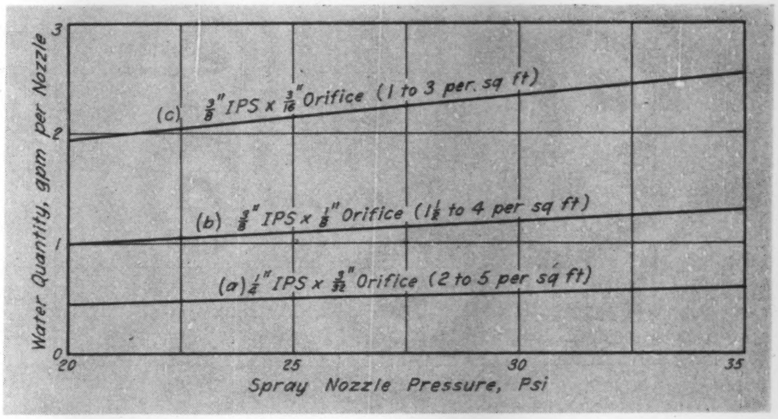
For evaporative cooling, large air quantities and a single spray bank are often preferred to lower air quantities and a double spray bank washer so as to not unduly raise the dew point or humidity of the air. It normally does not materially improve the evaporative cooling efficiency if the amount of water sprayed is increased beyond 2 gpm per sq ft of face area per spray bank. However, when cooling and dehumidifying, higher saturation will be obtained with the larger water quantities, but the limit of effectiveness is reached at 9 to 10 gpm per sq ft of face area, or about 18 to 20 gpm per 1000 cfm of air.

Practical Information Given

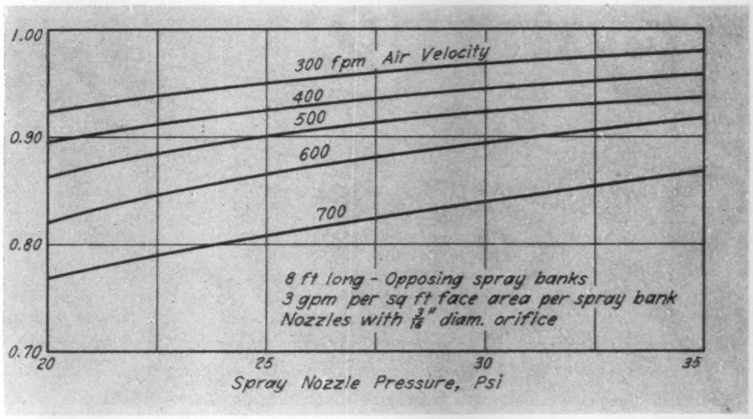
This article presents saturating efficiency figures from ASHVE data and performance factor curves derived from the published information of several manufacturers. This data is representative of average air washer performance under similar operating conditions. In the absence of more accurate information, this may be used by the engineer for selecting a washer for air conditioning duty with the expectation that the actual performance will be reasonably close to the predicted conditions. Of course, actual test data under various sets of operating conditions is much to be preferred. However, it is undoubtedly expecting too much that manufacturers will in the near future develop and publish complete performance ratings, due to the complexity of operating conditions encountered in practice. The data and methods of analysis outlined are designed to substitute for such unavailable test ratings.

Spray Nozzles

Capacities of three typical sizes of spray nozzles for air condition-



3 TYPICAL SPRAY nozzle performance curves like these are helpful in the design of the air washer for particular applications



4 THE PERFORMANCE factor *F* for a typical two spray bank dehumidifier may be obtained from these representative curves

ing work are given in Fig. 3. For a given water capacity, smaller nozzles require higher spray pressures, but will give a more finely divided spray with a higher resulting saturating efficiency than will larger sized nozzles. The smaller the orifice, however, the more the trouble from plugged nozzles. An effective strainer in the water piping ahead of the spray nozzles is necessary to prevent frequent stoppage of the orifices.

For the highest saturating efficiencies, 95 percent and higher, as when designing essentially for humidification, the smallest size *a* nozzle should be used at about 30 psi pressure with a capacity of 0.55 gpm. These ¼ in. IPS x 3/32 in. orifice nozzles would be arranged at 2 to 5 nozzles per sq ft of face area per spray bank, resulting in the spraying of 1 to 3 gpm per sq ft of face area per spray bank.

For ordinary air conditioning work a larger sized nozzle less subject to plugging would be used. The size *b*, ⅜ in. IPS x ⅛ in. orifice. nozzle has a capacity of 1.1 gpm at 25 psi pressure, which is typical of the nozzles upon which catalog ratings of air washers are based. The *b* nozzles are arranged at 1½ to 4 nozzles per sq ft of face area per spray bank, resulting in the spraying of 1½ to 4½ gpm per sq ft of face area per spray bank.

When designing a washer for cooling and dehumidifying, larger water quantities are required than for other applications. It often becomes necessary to use the larger size *c*, 3/8 in. IPS x 3/16 in. orifice, nozzle which has a capacity of 2.35 gpm at 30 psi pressure. These *c* nozzles would be arranged from 1 to 3 nozzles per sq ft of face area per spray bank, resulting in the spraying of 2 to 7 gpm per sq ft of face area per spray bank. However, tests have shown that not much is gained by spraying more than about 5 gpm per sq ft of face area per spray bank, or 10 gpm total per sq ft of face area for a 2 spray air washer. Nozzle pressures vary from 15 to 35 psi, resulting in pump head requirements of from 40 to 120 ft including normal pipe friction and static head.

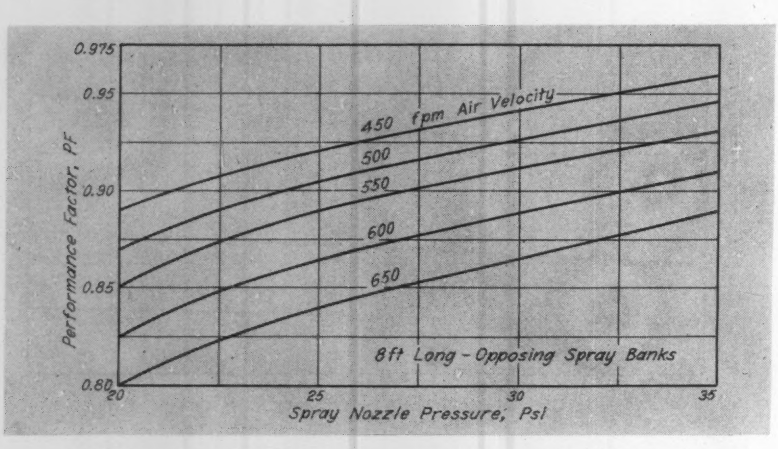
Evaporative Cooling

When the spray water is continuously recirculated, and 100 percent outdoor air is drawn through the air washer, evaporative cooling is accomplished. This is an adiabatic process wherein the air is lowered in dry bulb temperature but raised in dew point temperature without change in enthalpy—the wet bulb temperature remains constant. Theoretically for a 100 percent perfect air washer, the leaving air will be completely saturated at the entering air wet bulb temperature which will be the same as the spray water temperature. In practice, no air washer is 100 percent efficient so there will always be some difference between the leaving air dry and wet bulb temperatures.

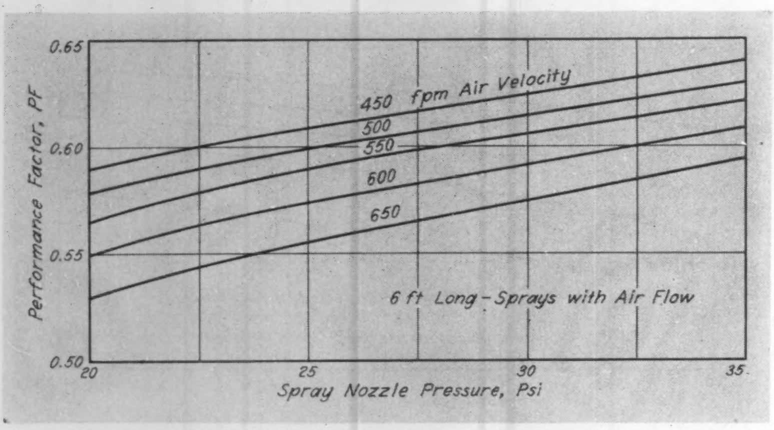
To evaluate the performance of an evaporative cooler, the terms saturating effectiveness *E*, or evaporative cooling efficiency meaning the same thing, are used. This relationship can be defined as the ratio of the actual lowering of the air temperature to the wet bulb depression—the difference between the entering dry and wet bulb temperatures. The following formula for saturating effective-

TABLE 1—SATURATING EFFECTIVENESS or efficiency of air washers (when used as evaporative coolers)

No. of spray banks	Direction of water spray	Length of washer, ft	Percent efficiency or saturating effectiveness
1	With air flow	4	50 to 60
1	With air flow	6	60 to 75
1	Against air flow	6	65 to 80
2	With air flow	8 to 10	80 to 90
2	Opposing each other	8 to 10	85 to 95
2	Against air flow	8 to 10	90 to 98



5 TYPICAL PERFORMANCE characteristics for one manufacturer's two spray bank air washer are shown here



6 PERFORMANCE CHARACTERISTICS for a typical single spray bank air washer are shown by these curves

ness is given in the 1953 edition of the ASHVE Guide:

$$E = (t_e - t_l) \;/\; (t_e - t_{wb}) \quad ..[1]$$

where E = saturating effectiveness ratio; t_e = entering air dry bulb temperature; t_l = leaving air dry bulb temperature; t_{wb} = entering air wet bulb temperature.

Equation No. 1 does not apply when there is cooling with dehumidification. It applies only to an evaporative cooling process wherein the wet bulb temperature of the air remains constant and the spray water is neither heated nor cooled. Table 1 gives typical values for saturating effectiveness for various types of commercial air washers when used as evaporative coolers.

Cooling with Chilled Water

If the performance of an actual washer relative to the performance of the 100 percent perfect washer when spraying chilled water were easily obtainable from manufacturers' rating data, the solution of a cooling and dehumidifying problem would be relatively simple. The difficulty, however, is that performance figures are not often listed in air washer catalogs, and the few manufacturers who do list such data often disagree as to the definition of performance.

For a cooling process involving dehumidification, one manufacturer[1,6] defines the performance factor with the following equation, which is that adopted by the National Association of Fan Manufacturers in its Bulletin 107:

$$F = 1 - [(t'_{wb} - t'_w) \;/\; (t_{wb} - t_w)] \quad ....[2]$$

where F = performance factor; t_{wb} = entering air wet bulb temperature; t'_{wb} = leaving air wet bulb temperature; t_w = entering water temperature; t'_w = leaving water temperature.

Applying the above equation to a perfect washer in which the leaving air and leaving water are at the same temperature ($t'_{wb} = t'_w$), it can easily be seen that the performance factor F will be unity. Typical values for F for a two spray bank dehumidifier are given in Fig. 4.

A more logical basis for thermodynamic performance, when the enthalpy of the air changes, is to use the actual enthalpy change divided by the enthalpy change in a perfect washer, both at the same entering air and entering water conditions. Such a ratio or efficiency represents the heat equivalent of the actual work done divided by the heat equivalent of the theoretical work done by a perfect washer. Such data are obtainable from one manufacturer[4] who defines the performance factor as follows:

$$PF = (h_e - h_c) \;/\; (h_e - h_s) \quad .[3]$$

where PF = performance factor; h_e = enthalpy at entering air wet bulb temperature; h_c = enthalpy at leaving air wet bulb temperature under actual conditions; h_s = enthalpy of saturated air leaving the theoretically perfect washer at the apparatus dewpoint temperature.

In the above definition it can be readily seen that the performance factor PF, is the ratio of the heat actually removed per lb of dry air to the heat that would be removed by a theoretically perfect washer with air leaving 100 percent saturated at the leaving water temperature. Typical values of PF for single and double spray bank air conditioning washers are given in Figs. 5 and 6.

With data on performance factor available, the conditions of the air and water leaving an air washer when cooling and dehumidifying can be rather accurately predicted by plotting the process on the psychrometric chart and using the fundamental heat balance equation:

Heat absorbed by the water =
Heat removed from the air

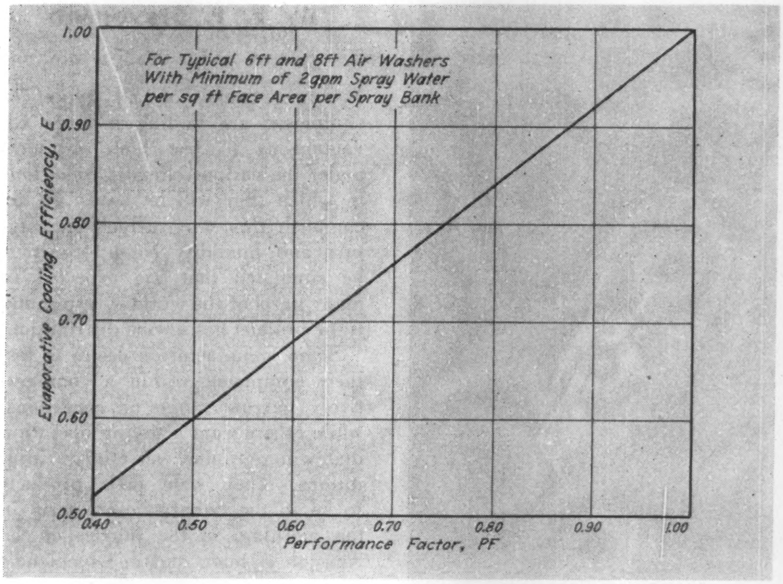
13 Steps Listed

The steps in the analysis are as follows:

1) Locate the outside and room air conditions on the psychrometric chart.

2) From the proportions of outside and recirculated air determine the mixed air conditions entering the air washer and locate on the psychrometric chart.

3) From the cooling load calculations determine the room sensible heat ratio, or Room sensible heat load/Room total heat load = Q_s/Q_t.



7 EVAPORATIVE COOLING efficiency as related to the performance factor for a typical air washer of one manufacturer

Draw the room sensible heat ratio line, Q_s/Q_t, through the room air conditions and extend to the saturation curve. The intersection with the saturation curve determines the apparatus dew point, *ADP*. This will also be the leaving air and the leaving water temperature for the 100 percent perfect washer.

4) From the washer entering air wet bulb temperature and the apparatus dew point, *ADP*, determine the entering enthalpy, h_e, and the leaving enthalpy, h_s, for the perfect washer. The difference in enthalpies, $(h_e - h_s)$, is the heat removal per lb of dry air by a perfect washer.

5) Determine the water to air ratio, W_w/W_a, for the theoretically perfect washer, by equating the heat given up by the air to the heat absorbed by the water.

6) From performance curves in Figs. 4, 5, 6 and 7 or catalog data of the manufacturer, determine the performance factor of the actual washer at the proper spray pressure and water velocity.

7) Apply equation (3) to find the heat removal, $(h_e - h_c)$ per lb of dry air by the actual washer, the heat content of the leaving air, and the corresponding wet bulb temperature.

8) On the psychrometric chart, locate the intersection of the room sensible heat ratio line with the air washer leaving wet bulb temperature just determined. This intersection locates the final air conditions leaving the air washer. A straight line drawn between this point and the entering air conditions will give the approximate path of the thermodynamic change of the air in passing through the air washer.

9) Knowing the room sensible heat load, the room temperature and the supply air DB temperature, calculate the required cfm supply air. Divide the cfm by the selected face velocity to determine the face area of the actual washer.

10) Knowing the required supply air quantity, and the air washer entering and leaving WB temperatures, calculate the total cooling load in Btu per hr by multiplying the lb of air per hr by the change in enthalpy per lb. Divide by 12,000 Btu per hr per ton to convert the cooling load to tons refrigeration.

11) Determine the leaving water temperature of the actual washer from a water to air heat balance using the water to air ratio W_w/W_a, as determined for the theoretically perfect washer.

12) Determine the spray water quantity by multiplying the air quantity in lb per min by the water to air ratio, W_w/W_a. Dividing the lb of water per minute by 8 1/3 lb per gal gives the spray water quantity in gpm. From nozzle performance data such as is given in Fig. 3, determine size, number and arrangement of spray nozzles.

13) If the washer leaving conditions show too great a spread between leaving air and leaving water, or between leaving dry bulb and wet bulb temperatures, it will be necessary to increase the water quantity or spray pressure and possibly to reduce the air velocity to improve the performance factor. Then a second calculation must be made for the new operating conditions.

[Professor Hendrickson's next article will contain several illustrative problems which will apply the methods outlined here.]

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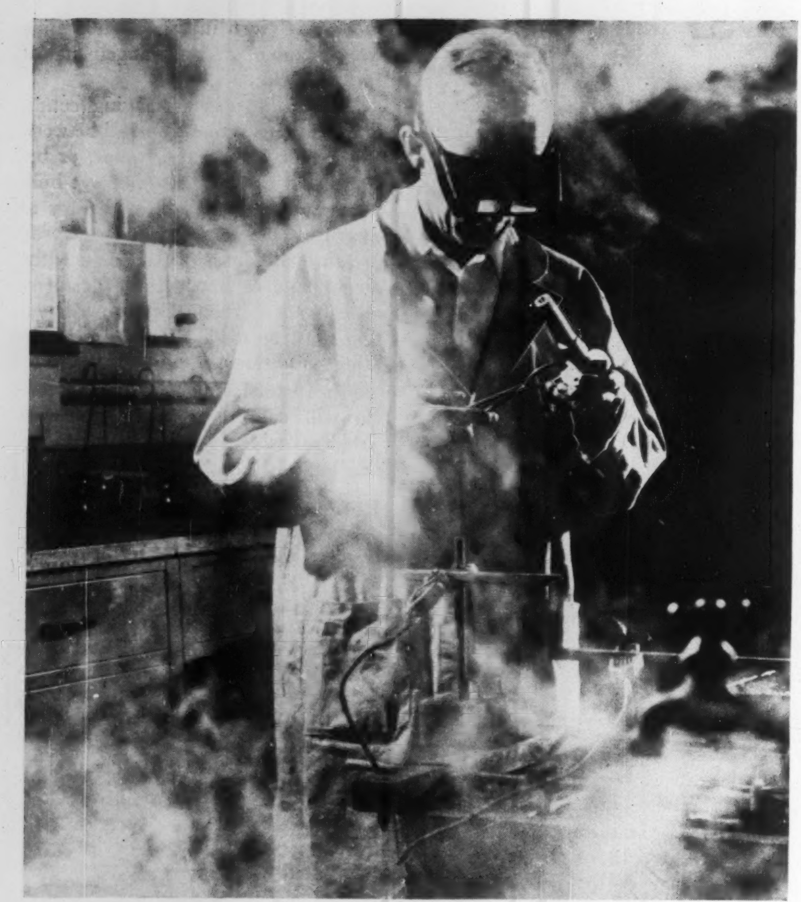
Alltime Construction High Set in '53

. . . 4 percent higher

A NEW ALLTIME high dollar-volume record was established in 1953 with $17,443,463,000 in construction contract awards, according to Dodge reports totals. This was 4 percent higher than the previous alltime mark set in the preceding year for the 37 states east of the Rockies. F. W. Dodge Corp. states that the large volume of contracts let in the second half of last year indicates that the amount of current construction activity and work to be put in place during the coming months are very high indeed.

Nonresidential awards were up 4 percent, and residential, although down a moderate 3 percent, contributed heavily toward making 1953 a record construction year.



"Check List" for Design

What factors must be considered in designing air conditioning systems for product test rooms?

This article is the first of a group planned to describe the details and factors that a design engineer must consider in laying out and installing air conditioning systems for product testing laboratories. This month the overall problems involved, the room location, test conditions, evaluation of insulation and vapor barriers are discussed together with the matter of humidity control with its attendant problem of defrosting the cooling coils. These articles are based upon the author's personal experiences in designing such installations.

By F. F. Stevenson

MANUFACTURERS of all types of equipment are finding it more advantageous to test their products under the various climatic conditions in which they will be used. To accomplish this, the various temperature and humidity conditions must be simulated that are expected in many parts of the world — especially if the product has a wide distribution.

Some manufacturers desire to test their equipment within a comparatively narrow range of conditions, while others want a testing operation that will reproduce all climatic conditions. They want their products to be in the Sahara desert early in the morning, in the jungles of the Amazon at noon and in Greenland's icy mountains by nightfall. Such migration puts a strain on even the best of magic carpets and a greater one on the designer of these installations, especially when the whole range of climatic variations is expected to take place in one small room. Also, the changeover from one condition to another, no matter how extreme, is often expected to be rapid. Many manufacturers see no reason why the equipment producing the simulated weather should ever take time out to catch its breath — regardless of the degree of change.

The design and installation of equipment for testing laboratories or rooms present many problems and quite a few develop into real headaches. The designer has to come up with all the answers, such as whether or not suspended water particles are permissible in a 100 percent saturated room. Oddly enough, it is the design of small testing rooms that cause the most trouble, especially when extremes of temperature and humidity are to be simulated.

Locating the Room Equipment

The engineer has much to consider when checking with the owner and architect about these installations. First, is the location of the room and the equipment. The room itself

Mr. Stevenson has contributed many articles to HPAC for over 15 years. He is a design engineer who has had wide experience in heating, ventilating and air conditioning. He has been engaged in contracting work and also with several engineering and architectural offices.

may be anywhere with a few reservations, but the location of the equipment is critical. The first rule is that all equipment should be easily and quickly accessible from the testing room. The operation of these rooms usually involves considerable checking and adjusting, and the operators should be able to get from the test room to the equipment space quickly and with little effort.

The space should be large enough to house the equipment and to permit two men to do whatever testing or service operations that are necessary. Another important item in locating the test room is provision for admitting outdoor air and exhausting air from the room. Usually, it is necessary to do both, and the location and size of the ducts should be decided early.

Where the air conditioning equipment and control system are fairly elaborate, I would strongly recommend that the equipment be installed in a space adjoining the test room — on the same level. Going up and down stairs many times a day is tiring even to persons in the best of condition, not to mention the time that is required. If the equipment space must be installed below the testing laboratory, be sure there is a stairway nearby. If the rooms are not directly adjacent, a telephone line between them is a great convenience and frequently pays for itself many times.

Where there is truss roof construction over the test room, it is very tempting to consider the truss space as a good location for the equipment. I would advise against this, unless the owner and architect are willing to spend the money to do it properly.

First, there must be enough space available overhead. Secondly, a substantial platform or catwalk must be built around the equipment, with enough walking and standing space to make all testing and service operations convenient and practical. Thirdly, suitable access must be provided, not only for the passage of testing personnel, but for removing or installing the equipment. A ladder is not considered to provide a good access.

I recall one installation where the owner required that the equipment be placed in the truss space with meager facilities for access. A trap door was in the suspended ceiling which could be reached by a ladder, and some loose planks comprised the catwalk. The room was used for extremes in climatic conditions, which called for much testing and checking. Operating under these conditions was a real headache, and after about a year of it, the owner installed a suitable platform and catwalk — which should have been done in the beginning.

Another simple item which is often neglected in these installations is adequate lighting. If the test room is under the roof, a penthouse on the roof is often satisfactory for the equipment — that is, if a suitable stairway is provided. If a penthouse is erected to house ventilating or air conditioning machinery for the building, a space may be provided in it for the testing room equipment.

Consider Surrounding Space

Most laboratories of this type are in larger buildings and many of them have 100 percent interior exposure, except perhaps for the roof. In calculating heat and moisture loads, be sure to find out what temperatures and humidities will be maintained in the surrounding spaces at all times — not only during the day but at night, over the weekends, and during plant shutdowns. Many testing rooms are required to operate without change in their environmental conditions for weeks at a time, so it is very essential to know all of the temperature variations to be expected in the surrounding spaces.

I remember one installation which was a hot room, where the surrounding space was held at 75 F during working hours in the winter, which was used in determining the heat loss. However, at night, and over the weekends the temperature of the surrounding space was reduced to 60 F. Additional heating capacity had to be provided in this room after operations were begun because this factor of lowered temperature in the surrounding space at night was not considered. When the test room is below a roof with an air space between the rafters, the temperature of this space at night and over cold weekends should also be carefully considered. This also applies to summer conditions, with the surrounding space cooled during the day but not at night or over weekends.

Insulation and Vapor Barriers

The insulation of walls, floors and ceilings of all testing rooms should be evaluated to bring about an economic balance between the flow of heat and the cost of insulation. Vapor barriers should be employed to prevent the migration of water vapor to a room held at a low humidity. What if the test room with no exterior exposures is expected to hold two extremes of climatic conditions, say cool and dry at one time and hot and wet at another? If the vapor barrier is placed on the outer side of the insulation to keep water vapor in the surrounding space from flowing into the test room while it is on the dry cycle, what happens when the room is operating on the wet cycle? The flow of water vapor then is from the test room outward, and it is trapped by the barrier on the other side of the wall. The temperature of the insulation may be below the dew point of the air and vapor mixture, and the vapor will very likely condense and soak the insulation. Does the answer lie in putting a vapor barrier on both sides of the insulation? With such construction, a super-trap is set up in the middle of the insulation and any water vapor which may leak in through cracks will have a hard time getting out before it condenses, and the insulation, after a period of time, may be ruined.

A solution for these problems may be to use an insulation which is impervious to moisture or is in itself a vapor barrier. Such materials may offer less resistance to heat flow than other types so that a greater thickness is required, but in many cases they provide the answer to water vapor migration and its condensation within walls, ceilings and floors.

For any room which is to be held at a low humidity, do not use a wall or ceiling finish that is a good vapor barrier. It will trap the vapor that is flowing from the outside, and eventually the insulation will get wet. Also, for any room to be held at a hot and wet condition, consult with the manufacturer before choosing any finish, paint or varnish. Many of these products, fine for normal use, will not stand up under a hot saturated atmosphere.

On an installation where the difference in vapor pressure across a wall or ceiling is high, adding an inch to the insulation, over and above the thermal transfer requirements, may eliminate condensation problems. On the other hand, under some conditions, especially if placed on the wrong side of the wall, additional insulation may aggravate the condensation of water vapor.

Some insulations have good structural strength while others do not. For floors, it is good practice to use an insulation which has a high structural strength for at least part of the thickness and the same advice applies to hung ceiling insulation. For walls which may be subjected to bumping by hand trucks and the like, select an insulant which is not easily cracked or broken. For floors on the ground, select an insulation which is impervious to water.

For cold rooms, hung ceilings which are laid on tee irons and supported from the side walls without vertical metal hangers may give less trouble than some others. If metal hanger supports are required, the construction should be so that the lower course of the insulation is not pierced by metal. If the insulation must be pierced, be sure that the hangers above the ceiling are well protected by thick insulating sleeves. Otherwise, condensation is likely to collect on the hangers and drip on the top of the ceiling.

Metal deck or pan ceilings are sometimes used, supported by hangers, with all the insulation above the metal. This provides a direct heat flow, entirely through metal, from the space above down to the cold room. In this case, the hangers must be heavily insulated.

With the use of suspended ceilings, the air space above should be cross ventilated adequately so that air with its attendant water vapor will not be trapped therein.

Test Room Doors

Test room doors are very important, either for cool and dry or hot and wet rooms, or both. For low temperature rooms, freezer type doors, swinging on the outside of the wall, should be used to offer a high resistance to heat flow inward and reduce crackage loss and for hot, wet rooms, the same type doors, metal clad, should be employed. Where extreme or critical conditions exist, an air lock arrangement or a vestibuled entrance is almost a must.

I recall one case where the owner wished to save money in the installation of a hot and wet test room. He had a couple of old refrigerator doors in his plant which he insisted on using for the new room. After about six months of use, so much moisture had leaked out around the perimeter of the doors, especially at the sill, that the insulation around this area was ruined and had to be replaced.

Is Room on the Ground?

Another thing that can often lead to serious trouble is the location of low temperature testing rooms on the ground floor. With so many industrial buildings having only one story and no basement, there is no other place to put them. With such installations, steps must be taken to prevent a freeze-up in the ground below the room. A freeze-up will buckle the floor and/or walls and perhaps cause serious damage to the room. If the room is small and if the ground is free draining, a freeze-up may never occur, but if the room is of fair size and with normal soil drainage, precautions must be taken. The average low temperature room will pull heat from the ground below faster than it can be supplied from the surrounding areas and sooner or later the temperature of the soil will drop below the freezing point. If water remains in the freezing area very long, it will freeze and expand, causing possible damage.

Many methods have been used to prevent these freeze-ups, such as special soil drainage, suspending the floors above the ground to provide an air space between the base of the floor and the ground, and heating the ground with hot water piping or with electric grids.

Ventilate the Ground

At present, a method that is widely used is that of ventilating the ground. Tile pipe or concrete tunnels are used to convey air through the ground under the low temperature room. For instance, 6 in. tile pipe laid on 6 ft centers or 6 in. square tunnels on 16 ft centers are recommended. The pipe or tunnels are open to outdoors on both ends and a low air flow rate is set up with air entering at one end and out the other. Any of these precautionary measures are expensive, but they or similar ones are essential as insurance against possible heavy freeze-up losses at some future date.

Controlling Humidity a Problem

An interesting solution to the major problem of the small room requiring one or more extremes of temperature and/or humidity is worthy of mention. This test room required at one stage a condition of 40 F and 20 percent relative humidity and a second stage of 110 F and 100 percent relative humidity. The first stage is quite severe from a low moisture standpoint — only 7½ grains per lb of air — and together with the hot and wet requirement, it presented many problems. One day was to be like a desert, the next day like a jungle.

The supply air required for both conditions was about 700 cfm. Considering the cool dry cycle, one way to reduce the moisture content to 7½ grains per lb is to employ a refrigeration system to dehumidify the air by cooling it down to the proper dew point temperature. Refrigeration is a satisfactory and simple way to dehumidify air in such an application, except for two factors. They are the defrosting problems encountered, and the difficulty of obtaining close and modulated control.

Defrosting and Control

Cooling coils operating at low temperature will frost up and the ice must be disposed of promptly and properly. Defrosting of course calls for an off cycle of the refrigeration equipment which certainly is not to be recommended when very dry conditions are required. The inherent characteristics of a direct expansion refrigeration system make a close modulating control almost impossible, unless very elaborate methods can be used. The advantages in using refrigeration for such work is that the equipment occupies little space, the cooling and dehumidifying processes are simultaneous and the average maintenance staff is usually familiar with the equipment used.

It is, of course, possible to dehumidify the air by refrigeration without a defrost cycle by using a brine spray on the coils, so that frost will never form. However, this again requires additional equipment.

A system with "Freon-12" as the refrigerant was designed with a direct expansion refrigeration coil and a small reciprocating refrigeration machine with a belt drive. The defrosting problem was considered from the beginning, and the use of two evaporator units was considered — with the operation of one "on" and the other "off" for defrosting — so that there would be a constant flow of cool dehumidified supply air to the space. However, the owner vetoed this — too much money and not enough space for the equipment. When the owner takes this attitude, the designing engineer may do himself a favor if he eases himself out of the picture at that point. Any anticipated profit is not worth the grief that is sure to follow, and the profit vanishes in thin air before the job is finished.

Air Dryers Help

In such installations, the peak load occurs during the pull down period. At the start of pull down, the room is at a normal condition or perhaps just emerging from a hot wet cycle and the work of dehumidification is heavy. If I were desiging the same job today, I would give the refrigeration equipment a little extra help during the pull down period. I would use a couple of air dryers using silica gel or similar chemicals to adsorb the moisture, and as the adsorbent material became saturated, I would recharge the dryers, making no attempt to reactivate the drying material. These could be used for several hours or longer, at the initial stage of the pull down period. During this operation, the refrigeration equipment would not be used, so as to avoid the formation of heavy ice on the cooling coil. When the room dew point was lowered sufficiently, then the refrigeration machine could be started.

The air supply to the room was either 100 percent return air or return air with a very small percentage of outdoor air, introduced only after the room was pulled down to the design condition. The internal latent load was not high, so it was anticipated that once the conditions in the space reached the desired values, ice formation on the coil would not be heavy and could be disposed of quickly. As a result, the off-cycle due to defrosting would be quite short. Unfortunately, this installation did not perform in accordance with this premise.

The cooling load on the direct expansion coil was based on supply air dry bulb and dew point temperatures of close to zero F and an entering air dry bulb of 40 F and a dew point of about 5 F.

Control Problems Encountered

The refrigeration equipment had no difficulty in reducing the air temperatures to the required dry bulb and dew point, but controlling it precisely was another matter. However, the lower limit of the dew point was rather elastic. In other words, if the relative humidity fell below 20 percent, it did not matter too much. The coil was fed by a thermal expansion valve and liquid refrigerant flow was started and stopped by a liquid line solenoid valve. If there had been a close humidity requirement, a direct expansion coil with such a feed and control could not have been used at all.

A solenoid valve is either off or on and one cannot modulate the coil capacity with such an arrangement. The thermal expansion valve only recognizes superheat, not variations in load. There are expansion valves available which modulate the flow of refrigerant in accordance to load. If the liquid flow is cut down too much on low loads, the return of oil from the coil is of course seriously affected.

The compressor that was selected had several steps of modulating control, which helped to afford long running cycles — even on low loads. Pump down control was used on the compressor. With such control, the actuating temperature and humidity control instrument opens or closes the solenoid valve and the refrigeration machine is started and stopped by a suction pressure switch. The "cut out" point was set quite low so that the running cycle would be as long as possible.

If a coil with chilled brine could have been used, close control through a three-way mixing valve or a throttling valve would have been easy, but with the conventional direct expansion coil, over-runs and under-runs could not be eliminated.

Draw Through Unit Selected

For reasons of economy and space saving, a standard suspended type of air conditioning unit was selected, with certain alterations made at the factory to house the fans, filter, cooling coil, defrosting heater, and also to provide return and outdoor air connections with dampers.

A cooling coil does not deliver saturated air, no matter how accurate the feed control, as an air washer can be made to do. There is always a variation between the leaving dry bulb and dew point, so that it is impossible to deliver air at a steady dew point temperature, which must be done in order to maintain a close humidity condition.

The air conditioning unit was of the draw through type, with the fans at the discharge end. On account of the defrost problem, a coil with wide fin spacing was selected in order to avoid clogging. A prime surface coil would be the ideal type, but such a coil would occupy more space than was available in the unit. And for the same reason, the spacing was limited that could be used with a finned coil. A coil with about 30 fins per ft was desired, but in order to get a coil into the unit with the total surface required, one with about 55 fins per ft had to be used. The coil was 10 rows deep. It was believed that such close fin spacing would not impede defrosting. The decision to use this coil was a mistake, as it was soon learned. An eliminator was used on the downstream side of the coil.

Defrosting With Duct Heater

Defrosting was to be accomplished by an electric duct heater placed just ahead of the coil. The wattage output of the heater was based on the heat requirement to melt the anticipated ice formation within five minutes or less. The weight of the ice formation was calculated by using a compromise between the weight of ice expected in the pull down operation and that of the normal operating cycle. This was another mistake, because the problem was to melt the ice formed during pull down and no compromise should have been made in the calculation.

There are other methods of defrosting, such as reversing the flow of hot gas from the compressor discharge, but this was too complicated for such a small system. Then there are proprietary methods which give good results, but these require special equipment, both for the heat storage and control. Naturally, as mentioned before, the employment of two conditioning units, with one "on" and the other "defrosting" would have been a satisfactory arrangement, if the cost element had not eliminated them.

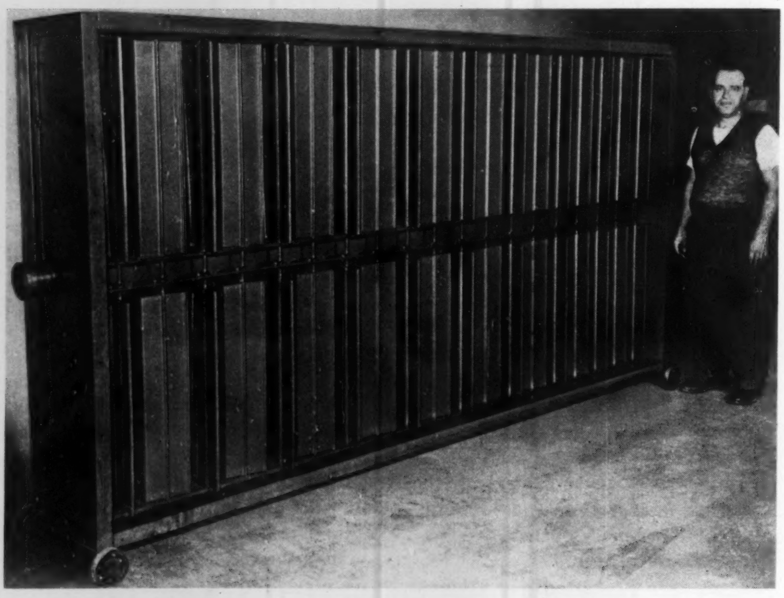
During defrosting, the conditioning unit operated on 100 percent outdoor air, with the air mixing dampers properly positioned through an interlock with the defrosting controller. It is well to remember that the electric defroster, when outdoor air is used, must be capable of heating the air, at zero F or lower, and to a temperature high enough to melt ice quickly. A source of indoor air for the defrosting cycle would be better than using all outdoor air, but this could only be provided at greater initial expense.

Inadequate Insulation Provided

Trouble with the conditioning unit was encountered from the very start. It was ordered with an insulation requirement suitable for the operating evaporator temperature, which was around −10 F, but it was delivered with the standard interior insulation used in stock air conditioning units operating at 40 or 50 F. So two inches of insulation was applied to the unit after it was received. To insulate an already built-up unit for low temperatures is a tedious process. A competent covering firm was employed, but any organization is no better than the men it employs on the job. In order to make certain parts of the unit accessible for servicing and lubrication, it was specified that the insulation be applied in a manner in accordance with these requirements—with various sections removable. However, before the work could be checked, the applier had the whole casing completely covered and sealed tight. Of course, parts of the insulation had to be torn out and replaced.

When a unit operates with cold dry air at one period and with hot saturated air the next, the matter of insulation is very important. It should be installed in at least two layers, with joints cross broken and sealed absolutely tight. The insulation should be impervious to moisture and the question of the application of a vapor barrier carefully studied. Also, the metal parts of the conditioning unit should be well rust-proofed to prevent corrosion.

Big Heater Section Serves Defense Project



THIS LARGE variable temperature heater section for delivery to a vital defense project will be used to furnish tempered make-up air to replace that exhausted by various processes

THE LARGEST variable temperature heater section built by the L. J. Wing Mfg. Co. for delivery to a vital defense project measures 10 ft in length. It will be used for making up air exhausted by processes to assure a supply of tempered air for the comfort and efficiency of employees in the area. It will also minimize drafts around doors and windows caused by lowered air pressures within the building.

Temperature control is achieved by blending many alternate streams of heated and unheated air.

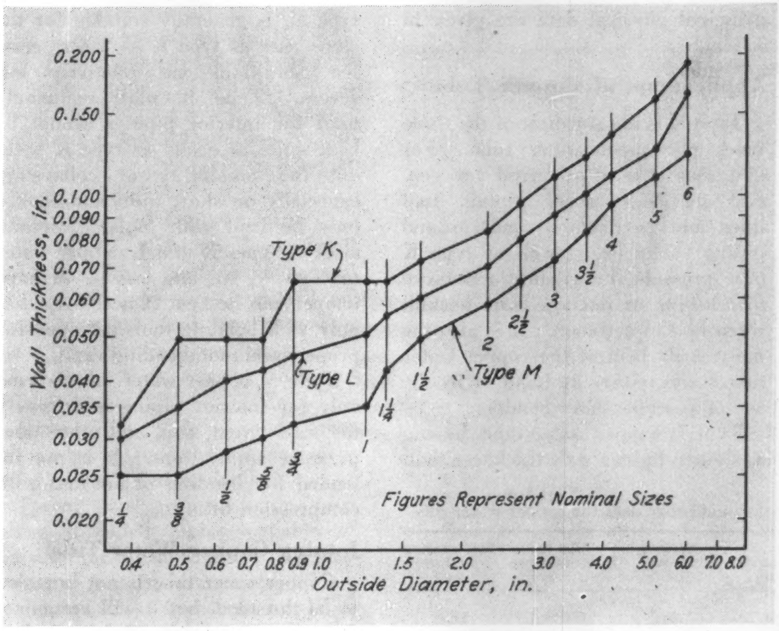
The plant has several large outdoor air systems used both for ventilation and heating. The variable temperature heating sections are used for preheat to bring the temperature of air from minus 20 deg to plus 55 deg. This air is then distributed through ducts to reheat coils for various zones with the air being heated according to the requirements of the zone thermostats. Thirty lb steam pressure is used on the coils.

The steam pressure is constantly maintained, and the temperature demands are met by damper controlled mixing of the proper amounts of heated and unheated air passing through the coils and bypasses. This is designed to avoid the danger of coil freezing.

Room Unit Shipments To Canada Increase

SHIPMENTS of room air conditioners to Canada during the first 10 months of 1953 were 7024 units, compared with 873 units during 1952, according to figures from the Air-Conditioning and Refrigeration Institute based on data released by the Bureau of the Census.

Manufacturers' total shipments (United States, Canada and foreign countries) increased about 194 percent during 1953 over the previous year, according to ARI estimates.



1 COPPER WATER TUBE is a seamless, deoxidized copper tube furnished in three types. Type K has the heaviest wall, type L an intermediate wall and type M has the lightest wall

Even though copper tube has now been in general use for about 30 years, there are frequent evidences that those using or specifying it are not as familiar with the characteristics of the various types as they should be. This article is intended to provide information that will be helpful in the proper selection of these products for specific applications.

A wide variety of seamless tube of copper and copper-base alloys can generally be obtained from fabricators according to specifications furnished by the purchaser. The information given, however, applies to what are known as commodity products that are in normal times readily available.

Copper Tube for Piping Systems

Characteristics and Uses of Various Types

By Doremus L. Mills

COPPER WATER TUBE is seamless, deoxidized copper tube and is furnished in three types — K, L and M. These letter designations were assigned to the industry by the National Bureau of Standards to indicate the relative wall thickness of each nominal size. Type K tube has the heaviest wall of the three, type L is of intermediate wall thickness, and type M has the lightest wall. Fig. 1 shows the relationships.

The term "copper water tube", used in industry as a commodity designation, should not be considered as implying a limited application of the product.

Early applications of copper water tube were for underground service lines from the water main in the street to the building. That may account for its present name. Soft temper type K copper water tube in 60 or 100 ft lengths is furnished in convenient coils which can easily be straightened so as to provide, in most cases, a continuous service between the curb cock and the cut-off at the water meter inside a building. Flared tube fittings are generally used for connections at the street.

Types K and L are furnished in both hard and soft temper. The soft temper tube is furnished in 60 and 100 ft coils up to and including 1 in. in diameter, and in 60 ft coils in 1¼ and 1½ in. in diameter; the hard temper tube in 12 ft and 20 ft straight lengths.

The choice between the use of hard or soft temper tube will generally depend on installation conditions. Frequent questions are raised on this point and their answers will depend on such factors as appear-

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Mr. Mills was associated for many years with Revere Copper and Brass, Inc. in the research department. He is now serving as a field representative for the Copper & Brass Research Assn.

ance, ease of handling and personal preference. In most cases, soft temper tube is used for underground or other concealed piping, and hard temper tube is used for exposed interior piping where the appearance and rigidity of the piping system are important features.

Type M copper water tube is furnished only in hard temper in 12 ft and 20 ft straight lengths.

A most important fact in connection with copper water tube is the relation between actual outside diameters and nominal sizes. The actual outside diameter of any copper water tube is ⅛ in. larger than the nominal or ordering size. The principal physical data are given in Table 1.

Applications of Copper Tube

Type K is the sturdiest of the three types of copper water tube. For that reason it is preferred for general service, process piping, fuel lines and particularly underground piping. The heavy wall of type K tube presents the greatest resistance to crushing or damage from backfill when laid in a trench. It is also the most easily bent of the copper water tube series, either by hand or by the use of portable hand benders.

Type L copper water tube, having a slightly lighter wall thickness than type K, is generally suitable for the same uses as type K — where service conditions are relatively less severe. Type L, most commonly used for interior piping, cannot be bent quite as easily as type K without the possibility of collapsing, especially on short radii and should only be bent with tools. Nominal sizes of types K and L copper water tube — ¾ in. and less — in hard temper can be bent if necessary, but only with bending tools designed for proper minimum bending radii.

TABLE 1—STANDARD DIMENSIONS, weights and other data for copper water tube[a]

Nominal size	Actual OD, in.[b]	Wall thickness, in.	ID area sq in.	Weight, lb per lin ft	Lin ft containing one U.S. gal	Safe working pressure, psi[c]
	Type K		*Furnished in hard and soft temper*			
¼	.375	.035	.076	.145	263.16	1120
⅜	.500	.049	.127	.269	151.57	1170
½	.625	.049	.218	,344	88.20	920
⅝	.750	.049	.333	.418	57.80	760
¾	.875	.065	.436	.641	44.20	880
1	1.125	.065	.778	.839	24.75	680
1¼	1.375	.065	1.22	1.04	15.82	550
1½	1.625	.072	1.72	1.36	11.17	520
2	2.125	.083	3.01	2.06	6.38	450
2½	2.625	.095	4.66	2.93	4.14	420
3	3.125	.109	6.64	4.00	2.94	410
3½	3.625	.120	9.00	5.12	2.14	380
4	4.125	.134	11.7	6.51	1.64	370
5	5.125	.160	18.1	9.67	1.06	360
6	6.125	.192	25.9	13.9	.744	370
	Type L		*Furnished in hard and soft temper*			
¼	.375	.030	.078	.126	246.78	900
⅜	.500	.035	.145	.198	132.76	800
½	.625	.040	.233	.285	82.50	740
⅝	.750	.042	.348	.362	55.26	650
¾	.875	.045	.484	.455	39.76	590
1	1.125	.050	.825	.655	23.33	510
1¼	1.375	.055	1.26	.884	15.32	460
1½	1.625	.060	1.78	1.14	10.82	430
2	2.125	.070	3.09	1.75	6.22	370
2½	2.625	.080	4.77	2.48	4.03	350
3	3.125	.090	6.81	3.33	2.80	330
3½	3.625	.100	9.21	4.29	2.09	320
4	4.125	.110	12.0	5.28	1.61	300
5	5.125	.125	18.7	7.61	1.03	280
6	6.125	.140	26.8	10.21	0.71	260
	Type M		*Furnished in hard temper only*			
⅜	.500	.025	.159	.145	121.06	—
½	.625	.028	.254	.204	75.70	—
¾	.875	.032	.517	.328	37.31	—
1	1.125	.035	.874	.465	22.03	—
1¼	1.375	.042	1.31	.682	14.71	—
1½	1.625	.049	1.83	.940	10.52	—
2	2.125	.058	3.17	1.46	6.08	—
2½	2.625	.065	4.89	2.03	3.94	280
3	3.125	.072	6.98	2.68	2.76	260
3½	3.625	.083	9.40	3.58	2.05	260
4	4.125	.095	12.2	4.66	1.58	260
5	5.125	.109	18.9	6.66	1.02	240
6	6.125	.122	27.2	8.92	0.71	230

[a] Industry Standards conforming to ASTM Spec. B88 and Federal Spec. WW-T-799.

[b] Nominal Sizes of 8 in., 10 in., and 12 in. are also available. Data relating to them can be obtained from the Copper & Brass Research Association, 420 Lexington Ave., New York 17.

[c] As copper tube will be subjected to a certain amount of annealing when heated joints are made, figures are given for soft temper tube only, based on ASA B31.1 — 1951.

Type M copper water tube is used only for interior piping and largely for waste, vent, soil, and other nonpressure applications. It is not intended for bending or for use with compression fittings.

Joining Copper Water Tube

Copper water tube is not intended to be threaded, but it will accommodate a wider variety of fittings than any other kind of piping. The most common method of joining lengths of all types of copper water tube in a piping system is by the use of what are correctly designated as solder-joint fittings. Such joints when properly made with 50-50 lead-tin solder or 95-5 tin-antimony solder are entirely satisfactory for the applications listed above.

U. S. Dept. of Commerce report No. BMS58 entitled Strength of Soft-Soldered Joints in Copper Tubing gives interesting information on this matter. The solders referred to are respectively limited in use to applications where temperatures do not exceed 250 F and 312 F. Where higher temperatures or excessive vibration are encountered, capillary brazing alloys should be used for joining copper water tube and solder-joint fittings.

Compression type fittings are widely used with types K and L copper water tube, especially where joints in the form of unions that can be made and taken apart without heat are advisable. Joints of this kind are preferable for piping in trenches where there might be difficulty in keeping the ends of the tube clean and in soldering.

Type B Copper Tube

A series of copper tubes whose outside diameters are the same as SPS pipe has been used in limited applications from time to time. This tube has sometimes been furnished according to specification MILT-873, type B, and has been known as type B copper tube. The industry at present is studying new standards for this product and information regarding it will be available in another article.

Red-Brass and Copper Pipe

These are relatively heavy wall products. They conform in general to standard pipe sizes and will accommodate standard pipe threading dies. They are furnished in standard 12 ft and 20 ft lengths, with unthreaded ends.

Dimensions, weights and other data relating to red-brass and copper pipe are given in Table 2.

These two products are used where threaded piping capable of resisting most conditions of normally corrosive waters is required. They are commonly installed in large buildings such as hotels, apartment houses, hospitals, etc. and are frequently used for industrial piping.

Red-brass and copper pipe are commonly used with threaded fittings but lengths can also be joined without threading by the use of capillary brazing alloys and special fittings intended for that method of joining.

TABLE 2—DIMENSIONS, WEIGHTS and other data for threaded SPS red-brass and copper pipe

Nominal size	Actual OD, in.	Wall thickness, in.	Weight, lb per lin ft Red-Brass	Copper	Lin ft containing one U.S. gal	Safe working pressure, psi Red-brass	Copper
			Regular pipe				
⅛	.405	.062	.253	.259	310.6	712	533
¼	.540	.082	.447	.457	175.5	1128	845
⅜	.675	.090	.627	.641	100.2	1090	818
½	.840	.107	.934	.955	62.9	952	715
¾	1.050	.114	1.27	1.30	36.2	868	653
1	1.315	.126	1.78	1.82	21.7	680	511
1¼	1.660	.146	2.63	2.69	13.1	732	550
1½	1.900	.150	3.13	3.20	9.6	674	505
2	2.375	.156	4.12	4.22	5.8	580	435
2½	2.875	.187	5.99	6.12	3.9	485	364
3	3.500	.219	8.56	8.75	2.6	544	408
3½	4.000	.250	11.2	11.4	2.0	600	450
4	4.500	.250	12.7	12.9	1.5	534	400
5	5.563	.250	15.8	16.2	.96	432	324
6	6.625	.250	19.0	19.4	.65	362	272
			Extra strong pipe				
⅛	.405	.100	.363	.371	588.3	2210	1660
¼	.540	.123	.611	.625	283.3	2640	1755
⅜	.675	.127	.829	.847	138.5	1970	1475
½	.840	.149	1.23	1.25	83.3	1752	1315
¾	1.050	.157	1.67	1.71	45.5	1520	1143
1	1.315	.182	2.46	2.51	27.1	1360	1020
1¼	1.660	.194	3.39	3.46	15.2	1195	898
1½	1.900	.203	4.10	4.19	11.1	1129	849
2	2.375	.221	5.67	5.80	6.5	1020	764
2½	2.875	.280	8.66	8.85	4.6	1000	754
3	3.500	.304	11.6	11.8	2.9	932	700
3½	4.000	.321	14.1	14.4	2.2	885	664
4	4.500	.341	16.9	17.3	1.67	856	644
5	5.562	.375	23.2	23.7	1.05	790	594
6	6.625	.437	32.2	32.9	.74	812	611

SPS red-brass and copper pipe are also available in 8 in. and 10 in. nominal sizes.

Data relating to these sizes can be obtained from Copper & Brass Research Association, 420 Lexington Ave., New York 17.

Specifications applying: Red-brass pipe — Federal Spec. WW-P-351 Grade "A"; U. S. Navy Spec. 44P12 Grade "A"; ASTM Spec. B43 (Red-Brass). Copper pipe — Federal Spec. WW-P-377; U. S. Navy Spec. 44P2; ASTM Spec. B42.

Extending Cooling Surface Factors Outlined

. . . by A. L. Hanson

MUCH HAS BEEN learned about extended fin cooling surfaces, which "were first introduced in commercial quantities in 1927," according to A. L. Hanson, vice president of Drayer-Hanson, Inc., in recent talks before various engineering groups.

Heat transmission is a function of inside surface coefficient, outside surface coefficient, thickness of heat transmission material, and thermal conductance of the material, he said. The inside surface coefficient is controlled by the type of fluid, shape of tube, and — most important of all — mass flow. According to Mr. Hanson, "an easy rule of thumb in determining the mass flow inside the tube is to use tons of refrigeration per circuit as a guide. Approximately the heaviest loading allowable per circuit is 1.7 tons, and then only if the circuit length is short — about 30 ft maximum. If we don't stay within this range, pressure drop is too high, we hit the lower range of heat transmission rate, and the low velocities fail to carry the oil back to the compressor," he said.

"The third resistance to the flow of heat in the coil is the outside surface coefficient. It has been found that serrated fins will give the highest rate of heat transfer per lineal foot of finned tube," according to Mr. Hanson. "However, most air conditioning coils use the plate type fin, primarily due to moisture carry-over factor," he stated.

"Extended surface can be used just about anywhere, with the only exception being in process work where exact moisture content of the air is desired. In such cases, an air washer or spray type dehumidification units should be used," he said.

Mr. Hanson suggested these fundamental rules in applying finned coils for refrigeration work: (1) Select as close to a 10 deg temperature difference (TD) as possible. (2) Use close fin spacing for room temperatures above 34 deg, providing the refrigerant temperature doesn't fall below 24 deg and moisture load is not heavy. (3) For low temperature applications, fins spaced four to the inch will be satisfactory for most applications, excepting loose freezing and meat hot box applications.

"Industrial Construction To Continue High"

INDUSTRIAL AND process plant construction during 1954 will continue at the substantially same high level as 1953's record, officers of the National Constructors Association predicted at the organization's annual meeting in New York this year.

The association is composed of leading firms engaged in design and construction of chemical plants, power plants, steel mills and petroleum refineries. Its members operate on a worldwide basis.

"Little doubt exists among our membership that the outlook for our industry during the coming year is very optimistic," said John J. O'Donnell, retiring president.

TRUCK LOADED with bundles of plastic pipe travels alongside the ditch with one man distributing the bundles. Each bundle contains six 20 ft lengths of 3 in. ID pipe. Twelve revolutions of a tire wheel marked with paint is the measure for dropping each bundle of pipe. A bundle of plastic pipe weighs only 80 lb

JOINING THE plastic pipe was accomplished by applying a solvent liquid, then a solvent cement to the pipe and inner surface of the slip sleeve coupling

Nine-Mile Plastic Pipe Line

. . . . conveys corrosive crude oil underground. Light weight simplifies installation, smoothness aids flow

By Dennis C. Guthrie
Eastman Chemical Products, Inc.

A CROSS-COUNTRY pipe line entirely of plastic is in service at Poplar, Mont., delivering crude oil from a producing field in the Williston oil basin to a shipping point on the Great Northern railway more than nine miles away.

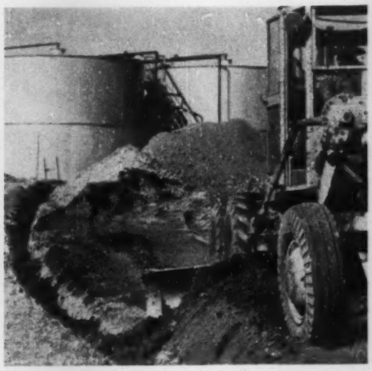
The pipe used is 3 in. ID with a wall thickness of 0.125 in.; it was produced of butyrate plastic by the extrusion process. Designed to operate at a maximum pressure of 90 psi at a temperature of 60 F, the line was planned to deliver 2500 barrels of crude oil per day, with facilities for increasing the capacity. Because of the smooth interior surface of the extruded butyrate pipe, the friction loss is low. It is estimated that the percentage of increase of flow through the plastic pipe line may eventually run as high as 40 percent, representing a considerable saving in power for pumping.

Three Booster Pumps

The crude oil storage tank battery from which the pipe line runs is 2090 ft above sea level. The railroad siding at Poplar where the line ends is 1940 ft above sea level. The drop from the storage tanks to the delivery point is, therefore, 150 ft. This would provide a natural gravity flow; however, between the storage tank battery and the railroad siding, the line must cross a point where the elevation is 2100 ft. In order to maintain the flow as desired, three booster pumps, each capable of pumping against a head of 78 psi, were installed. Booster pump No. 1 is at the head of the line, No. 2 is approximately 13,750 ft from No. 1, and No. 3 is approximately 17,900 ft downstream from No. 2. Three pumps of smaller head capacity as required along the line provide flexibility and dependability of operation, and economy in first cost. The capacity of the line can be varied by operating only one or two pumps. The line is capable of flowing at a reduced rate in the event one pump

CONNECTION of the plastic pipe line was made at the storage tank battery by means of a flange adaptor especially designed for joining the butyrate pipe to steel. The plastic half of the flange is joined to the end of the pipe line by means of solvent cement in the same way that lengths of butyrate pipe are joined

A FINAL tightening of bolts on the flange adaptor near the storage tank battery, and the butyrate pipe line is ready to take the flow of crude oil from this point of origin to the shipping point more than nine miles away. It is estimated that the plastic pipe line will increase the flow rate as much as 40 percent



AN EARTH MOVER was used for backfilling the ditch containing the plastic pipe line. This particular installation — in northeastern Montana, where the frost line is deep — was buried to a depth of 5 ft, 4 in. to assure maximum flow of oil during the winter. Ditch was dug by means of a conventional rotary ditch digger

is down for repairs. This is accomplished without installing spare pumps.

Important considerations in the choice of the butyrate plastic pipe are its high resistance to corrosion, apparent freedom from paraffin clogging, and low cost of installation. The crude delivered through the line is a paraffin-base oil containing corrosive sulphuric gas. Preliminary tests indicated that the butyrate pipe will conduct this oil without paraffin accumulation.

Quickly Installed

Installation of the pipe line was made with a crew of three using slip sleeve couplings and solvent cement. Where it was necessary to cut the pipe to fit, an ordinary handsaw was used. Joining the pipe in a continuous length required a total working time of about five days, averaging approximately 10,000 ft per day. One 20 ft section of the pipe weighs only 13 lb.

The pipe was joined on the ditch bank in a continuous length and then lowered by one man into the ditch. It was snaked in the ditch so that the pipe touched the opposite sides of the ditch about every 200 ft, to allow for contraction and expansion due to temperature changes. Because of the depth of the frost line, the ditch was dug about 5 ft, 4 in. deep to assure maximum flow of oil during the winter. The ditching was done by a conventional rotary ditch digger with a speed of 800 to 1000 ft per hr. A blade earth mover was used to cover the pipe.

The pipe line is owned by Plastic Service Lines, Inc., Denver. The engineering was done by J. A. McCormack, Denver; Floyd Oliver, Greeley, was consultant. Hadyn Thomas & Sons, Billings, Mont., was the construction contractor.

Widely-Used Flange Standard Revised

One of the most widely-used American Standards — Steel Pipe Flanges and Flanged Fittings, B16.5 — has been revised and supplemented because of new materials developed in this field. The revision provides for 15 different types of steel; covers nominal pressures of 150, 300, 400, 600, 900, 1500 and 2500 psi; and includes references to valves.

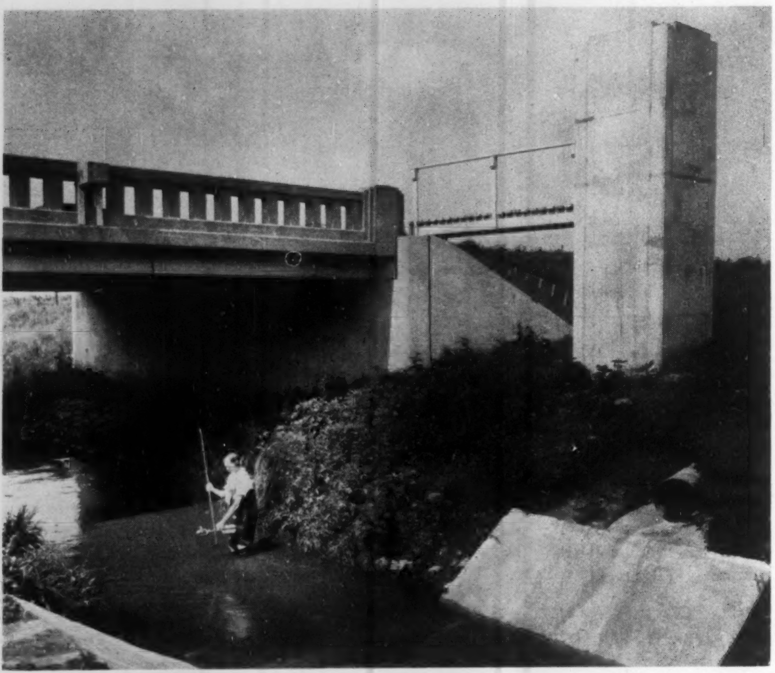
Vice Admiral George F. Hussey, Jr., managing director of the American Standards Association, announced that the new edition of the standard is now available. He pointed out the importance of the changes and additions made in the standard to users and manufacturers of steel pipe flanges, fittings and valves.

"This standard now provides a method for rating materials so recorded that it will be possible to give all new materials developed in the future the proper pressure-temperature ratings. This will solve many of industry's headaches before they occur," Admiral Hussey stated.

Other new data in the standard are the designation of drain locations on valves and specifications for threaded, socket welded, and butt welded drain connections, and for the diameter of bosses for drains.

The new standard is the result of more than three years' work by sectional committee B16, on pipe flanges and fittings, organized in 1920 under the procedure of the ASA. The committee is jointly sponsored by the American Society of Mechanical Engineers, the Manufacturers' Standardization Society of the Valve and Fittings Industry, and the Heating, Piping and Air Conditioning Contractors National Association.

Chairman of the committee is E. LaCrosse, vice president and director of engineering, Stone & Webster Engineering Corp. The secretary is Lester W. Benoit, general manager, Manufacturers' Standardization Society of the Valve and Fittings Industry. The standard may be obtained from the American Standards Association, 70 E. 45th St., New York 17, N.Y., for $3.



MUCH OF THE 170 billion gallons of water used per day is returned to streams and is thus used more than once

Water Conservation

. . . is of growing importance as usage continues to increase. Air conditioning a big factor

By Kalman Steiner
Engineer
C. Hoffberger Co.

• Water is vital to man's existence and his comfort. Air conditioning is directly affected by the necessary water conservation and restriction measures that are being put into practice. Water must be conveyed through piping from the source either to industrial plants where it is used in cooling processes — a major use comprising three-fourths of the consumption — or to conditioning equipment or to boilers where it is used for heating.

WATER is perhaps the world's most important mineral. Without it, no life can exist. There is no substitute for it. In 1950, American industry used about 120 billion tons of water (not including the stream flow in hydroelectric plants). This is about 50 times the combined weight of all other industrial materials that are used. It is understandable, then, that industry has followed the pattern of civilization itself, by flourishing along the seashore and along the world's water courses. Just as ease of water transport, abundance of rainfall, and fertility of soil have determined where and how man shall live, so similar factors have determined the location and nature of industry.

Water Is Unique

As a natural resource, water possesses unique characteristics. Alone among all mineral resources, it replenishes itself. True, water supply can be affected — sometimes seriously — by variation in amount, but no other mineral resource restocks itself. All other mineral deposits sooner or later approach exhaustion, including fertility of soil unless restored artificially. For the most part, other minerals are transported, in one form or another, before ultimate utilization, but water, generally speaking, must be used where it occurs. There are important exceptions to *in situ* usage, of course, such as municipal supply and irrigation for agriculture.

The availability of water, even in regions usually considered non-arid, has definite limitations. For many years, little thought was given to the results of extravagant water usage, or of municipal and industrial expansion exceeding the availability of water supply. The problem was brought into sharp focus during the last war by the fact that plans for over 300 industrial or military establishments had to be abandoned or altered because of inadequate water supplies. In recent years, the overall subject of water supply has received concentrated investigation. Currently, at least six commissions and committees (both interstate and federal) are studying the problems.

The natural processes which replenish water supply are known collectively as the hydrologic cycle.

Mr. Steiner is a member of HPAC's board of consulting and contributing editors.

The total amount of water (liquid, gas and solid) in, on and around the earth remains practically constant. Very little water disappears permanently because of destructive use. A small amount of newly formed water results from chemical action (such as in the combustion process). But carbon and hydrogen in fuel are returned by combustion as carbon dioxide and water to the atmosphere whence they originated. The oceans constitute the world's water reservoir. By complicated processes not yet fully understood, this inexhaustible resource evaporates under the influence of solar radiation, moves over land area, precipitates, flows over or under the ground, and returns to the oceans at the rate of about 1200 billion gal per day for the U. S.

Thus, the same water passes again and again through our environment in a hydrologic cycle. During its passage in the liquid phase, it serves man a myriad of purposes. Vast amounts of water are transpired through the pores of leaves and other surfaces of vegetation and are returned to the atmosphere. But the ultimate destiny of water is to return to the sea.

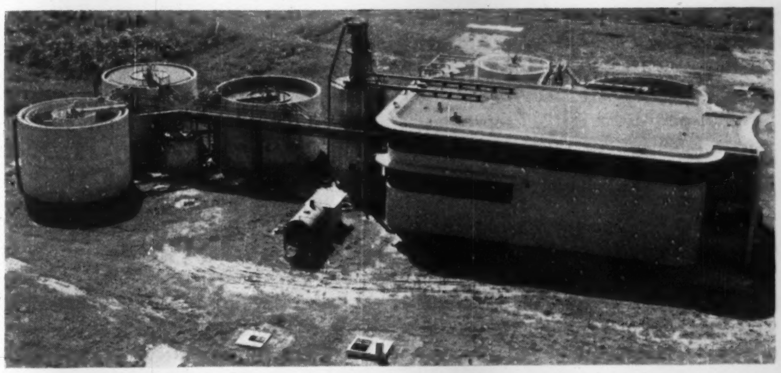
Usage Multiplies

In 1900, the per capita use of fresh water in the U. S. represented between 500 and 600 gal withdrawal from wells and streams daily. During the past half century, our population has doubled, but the per capita water use increased to 1100 gal per day — representing a fourfold increase in total water demand from 1900 to 1950. The U. S. Geological Survey estimated that the 1950 water withdrawal for all purposes was 170 billion gal per day, equal to about 15 percent of the total water discharged to the sea during an average year. Much of this water returned to streams and was used more than once. In addition, about 15 billion gal per day of sea water or brackish water was used for industrial cooling purposes during 1950.

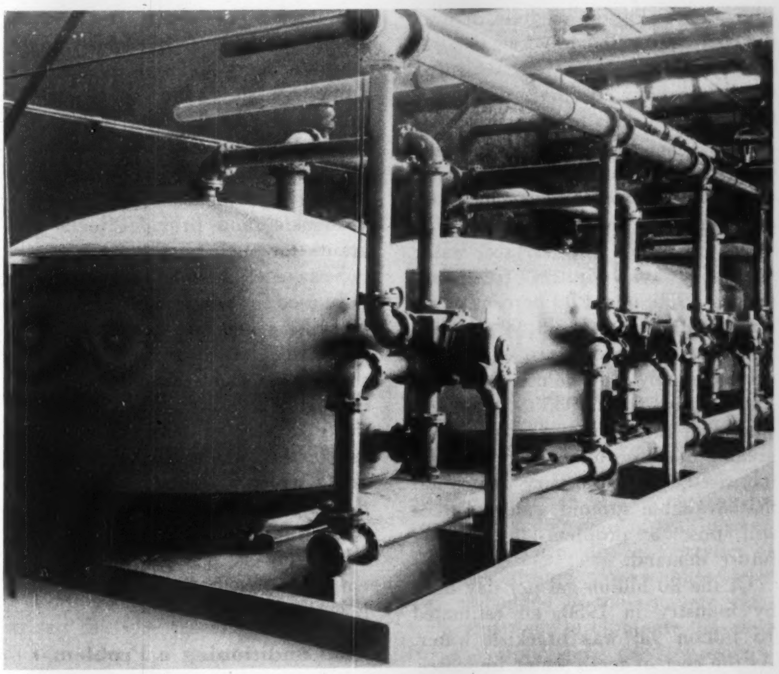
Two Classifications

Water serves a great variety of uses in an industrial plant, but in general all water supply in industry can be considered in two broad classifications — sanitary and industrial. Sanitary water is that which is concerned with personal health and therefore must be safe from the viewpoint of the life processes. This is the water used for drinking, dishwashing, in lavatories and showers, laundering, and is incorporated into food, beverages and pharmaceuticals. Industrial water serves all other industry's needs, such as boiler feed, cooling and hydraulic power. Taste, color and content of pathogenic organisms determine the qualities of a sanitary water supply but are unimportant in industrial water. On the other hand, a satisfactory sanitary supply may have properties that make it unfit for use as boiler feed or cooling without chemical or physical treatment.

In large industrial plants, the amount of sanitary water needed is small compared to the industrial requirements (unless the plant is producing a food or beverage product or a pharmaceutical), and can be provided from a municipal supply or from part of the intake by special treatment. In smaller plants, municipal supply is usually the only one available and must serve all purposes regardless of cost. But most large water users would find the cost of sanitary water prohibitive for large scale operations such as in power, cooling and mineral washing. The magnitude of demand for industrial water supply can be illustrated



INDUSTRIAL PLANTS often use equipment like this to soften and clarify the water



WATER MUST BE conveyed through piping to and from conditioning equipment used in industry by a few examples. For instance, 65,000 gal is required to make one ton of steel, 64,000 gal to produce one ton of sulphate paper and one barrel of petroleum refined represents a water demand of 600 gal.

Cooling Is Major Use

But no sweeping generalization concerning the purity of requirement for industrial water is possible. Probably three-fourths of all industrial water is used for cooling, where the quality requirement is low. The next largest volume of water used by industry is for washing, grading and waste disposal, for which purposes quality can be medium or low. But a proportionately small but rapidly growing requirement is for water of relatively high purity — free of organic matter, mineral acids and gases — in the chemical industries, such as in the manufacturing of plastics. Ground water in many cases has the required purity for such processes, but surface water almost always requires treatment. During 1950, about 80 percent of all water withdrawals, and 90 percent of industrial withdrawals, were from surface supply. But the use of ground water tripled from 1935 to 1950, and since that rate of increase was much greater than the total water demand increased, there is every indication that available ground water sources will pose a problem in meeting future demand.

Of the 80 billion gal per day used by industry in 1950, an estimated 15 billion gal was brackish water. As the cost of fresh water increases, it is probable that the proportion of sea water will increase. The highly corrosive nature of salt water necessitates special metal in the equipment with which it comes in contact, including the piping. Obviously, increasing cost of fresh water brings into the realm of possibility the higher investment involved in these special metals to permit the use of saline water.

Pollution Control

Water pollution constitutes a constant threat to all water supply. According to the U. S. Public Health Service, there are about 22,000 major sources of pollution in the U. S., half of them being municipal sewer outlets and the other half being discharge outlets from private industry. Relatively few cities have maintained their development of sewage disposal plants at the same level as population increase. Many cities plan such developments as soon as practicable and materials and funds become available.

The water pollution control act of 1948 has provided the beginnings of a program of federal cooperation with states and interstate bodies. Under the act, the Surgeon General of the Public Health Service, in cooperation with other interested agencies and groups, is authorized to prepare comprehensive programs for interstate streams and underground waters, and to undertake research on specific problems. It declares to be a nuisance any pollution of interstate waters which endangers health or welfare of persons other than in the state where the discharge originates. It grants congressional sanction to interstate compacts on pollution abatement, and provides loans and grants for such purposes.

Sewage effluent has been successfully used for condensing and cooling in at least one major industry — a large steel mill. Small-scale water reclamation plants have been successfully treating sewage and industrial waste to recover perfectly safe and satisfactory water, the effluent water being allowed to percolate through the earth to restore depleted ground water supply. In many areas, such recharging is necessary to prevent entrance of salt water because of a low water table.

Air Conditioning a Problem

In view of the sharp limits to available municipal water supply in many cities, water requirements for air conditioning constitute a serious problem. Not long ago, for example, New York City was faced with a water shortage so serious that many uses were curtailed, such as air conditioning, lawn sprinkling and car washing. New York newspapers point out editorially that the city's water supply problem still has not been solved from a long range viewpoint. Water for comfort cooling would be one of the first uses to be curtailed in a prolonged shortage. Baltimore municipal water supply is not nearly as critical as is the case with many other large cities — yet in Baltimore, from June through September, water requirements for air conditioning approach 10 percent of the total municipal supply and the constantly increasing demand is a matter of concern to the city.

The use of well water for air conditioning of course can relieve the municipal supply, when ground water is available at an economical cost. In Long Island, however, extensive draw on underground water for air conditioning threatened to lower the water table sufficiently to allow salt water to enter. Many Long Island communities now require that effluent water from air conditioning condensers be recharged into the earth to maintain a safe water table level. Philadelphia has imposed a sewer tax, which can serve to check unrestricted dumping of water. Baltimore requires that discharge from a cooling system be connected only to a storm sewer; a sanitary sewer cannot be used for clear water effluent disposal.

Reducing Requirements

It has been estimated that 90 to 95 percent of the water wasted in non-evaporative condensers or "once-through" condensers can be saved by the installation of water cooling towers or evaporative condensers. For Baltimore, it is estimated that such water conservation equipment cuts water demand from 90 gph per ton of refrigeration capacity to 9 gph per ton. Obviously, as soon as water rates reach the point of economic balance, it will be cheaper to install recirculating systems than to pay for water consumed in a "once-through" system. More attention will have to be paid, also, to regulating devices, such as modulating control valves on cooling water and shut off valves, so as to prevent water wastage from worn or poorly adjusted equipment.

Looking at the problem of water supply in its broadest aspects, it seems that a complete solution cannot be reached from local, independent effort seeking to solve only the specific problems of a single industrial plant or municipality. The problem is national in scope, and embraces more than water as such, for land reclamation, power, recreational facilities and many other considerations are equally important. On January 3, 1950, a federal temporary water resources policy commission was created to prepare recommendations for a comprehensive policy of water resources and related land use development. After a year of study, this commission published a three-volume report in 2023 pages. Vol. 1 covers general recommendations for a national water policy; Vol. 2 outlines suggested programs for 10 river basins, and Vol. 3 reviews existing water resources legislation.

Commission Reports

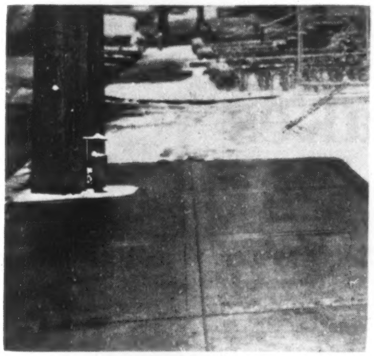
The report states that "the preservation, enhancement and use of the people's heritage in land and water resources is a major responsibility of the federal government." In accordance with that viewpoint, the commission proposed that the nation be divided into river basin districts for the purpose of planning and executing comprehensive, integrated programs for the maximum utilization of these resources. The contemplated scope of such a federal plan can be judged from the commission's estimate that an adequate program of conservation and development might cost the nation, over the next generation, about $100 billion. The commission solicited suggestions and recommendations from interested groups, including the Engineers Joint Council. The latter instructed its national water policy panel to prepare recommendations for a national water policy. The panel organized a group of 75 engineers, geologists, agricultural economists and recreational planners, drawn from the fields of consulting engineering practice, state and municipal service, university and other institutional organizations and industry. Its policy was based on the principle "that control of the waters of the U. S. is in the national interest but not necessarily a function of the federal government," and advocated basin-wide planning of water resources development, as far as practicable under the control of local enterprise, governmental and private. The council feels that the commission failed to give proper consideration to its recommendations.

The interior and insular affairs committee of the House of Representatives started in 1952 the publication of a series of reports called The Physical and Economic Foundation of Natural Resources. Three volumes were published in 1952, and a fourth in 1953. Of the four, the last three are devoted to water supply. The reports consist of a series of articles by specialists, mostly in government service but including a few from private life. These three volumes include a wealth of information about water supply.

[In the preparation of this article, the author has drawn on material in the last three volumes cited, as well as material in Resources for Freedom, commonly known as the Paley report, numerous publications of the U. S. Geological Survey, and Water in Industry, published by the National Association of Manufacturers jointly with the Conservation Foundation.

The author wishes to express his appreciation to the following for assistance in preparing this article: Jack B. Graham, chief of water utilization section, U. S. Geological Survey; K. H. Schamberger, Baltimore City Bureau of Water Supply; and S. M. Worthington, Maryland Refrigeration Co., Baltimore.]

Heating Cable Protects Piping, Has Many Other Uses



ELECTRICALLY HEATED sidewalk for warehouse eliminates snow shovelling

APPLICATIONS of electric heating cable made during normal maintenance periods or at the time of new construction show how pipe lines, sidewalks, roofs and other exposed locations are being protected this winter from ice, snow and sub-freezing temperatures, the Edwin L. Wiegand Co. reports.

There is an application of the cable to heat a water pipe at Applewold, Pa. The wire is wrapped around a 150 ft section of the supply pipe which is attached to the under side of a bridge crossing the Allegheny river. Before the cable was applied, water had been freezing in the last 55 ft of travel. Now, a continuous supply of water is assured by energizing the 18 kw installation when required by weather conditions and reduced rate of flow in the pipe.

Another type of use is demonstrated by the installation in the canopy over the attractive entrance to the new Alcoa building in Pittsburgh, where 1600 ft of the cable on top of the canopy's cantilevered reinforced concrete shell prevents snow and ice accumulations. Capacity is 8 kw, operating infrequently.

The Wiegand company, Pittsburgh, uses the cable in several ways. It is embedded in two tracks on the slope of a driveway to a parking lot to assure smooth flow of traffic when it snows. Then, during repaving of the area around a warehouse, wire was embedded in the concrete sidewalk and steps to eliminate the need for shoveling snow and to provide greater safety for employees. The cable has also been installed around several stacks on the roof of the plant to prevent condensation from forming inside.

New Definition for Heating

HOUSTON has been widely publicized as "the world's most air conditioned city." Air conditioning is so widely in use there that heating is defined as "negative air conditioning," according to Dr. Walter W. Kemmerer, executive director of the Houston world's fair, in his address at the annual banquet of the American Society of Heating and Ventilating Engineers.

Mayor Roy Hofheinz — in a talk at a luncheon during the same meeting — said that "a modern retail business could not survive in Houston without air conditioning." According to Mayor Hofheinz, the old four story Fulton trading post, not too many miles from Houston at Rockport, Texas, had ducts for both heating and cooling, was thus a "pioneering air conditioning installation."

With all the fine words said about Texas air conditioning at the meeting, one delegate (from California, of course) spoke highly of "the beautiful Texas clouds, which reduce the solar load on buildings."

VALVES — like other equipment — should be treated with care

ANYTHING CAN HAPPEN

Testing Valves Takes a Lot of "Know-How"

By Bill Dopp

• Almost anything can happen when you're in the engineering, operating, contracting or sales ends of the heating, piping and air conditioning industry. The objective of this more-or-less regular editorial feature in HPAC is to discuss practical problems that need solving — and ways to solve them.

Bill Dopp has had 40 years of experience dealing with piping, including a long stretch of service as a sales engineer. He is devoting some of his present leisure to drawing on his many piping experiences, as he does in this story . . . .

"COME ON IN, MAC. I'm so mad that I can't see straight." Gene Stewart glared at Martin MacVane, who had just stepped into his office.

Mac looked surprised — he knew Gene very well. In fact, he had helped him get his first job with the plastic company, of which he was now the superintendent. He said, "What's the matter now, Gene? You're always getting mad about something. Calm down and relax. Things aren't half as bad as they seem."

Valve Leaks Like a Sieve

"That's what you think," retorted Gene. "I have the worst luck with valves. Take a look at this thing." He handed Mac a 1 in. brass gate valve of the quick opening type. "That valve leaks like a sieve. Look at how loose the disc is when it's closed. It's supposed to be a brand new valve, too, and I've got 23 more like it."

"When did you get them?" Mac inquired casually.

"Yesterday," replied Gene. "What difference does that make?"

"I don't know. What did you do to them?" Mac was turning the valve over in his hand. He looked puzzled. "Someone has surely been giving this poor valve a hard time."

"Listen, Mac, I'm fully aware that I don't know all of the answers, but I do know a good valve when I see one. We test every valve that we get, and they have to be tight. I've got a lot of small relief valves that are just as bad as these quick opening gates."

"You don't have much faith in the people you buy from, do you?" Mac was just a bit sarcastic. "Every valve that leaves that factory has been carefully inspected and tested before it leaves there. Why do you have to test it again?"

Gene assumed an air of tired patience. "When we have to replace a valve on one of the machines, we have to do it in a hurry. We can't afford to get the whole thing all hooked up and then find that the crazy valve leaks. Those machines are production units and have to keep going. Outages cost a lot of money in these days of high labor costs."

"Sounds like a good reason," said Mac slowly.

"Mac, that has all the earmarks of double talk," declared Gene sharply, as he eyed Mac suspiciously.

How Do You Test the Valves?

"Let's quit arguing," replied Mac. "Show me how you test these valves."

Gene hesitated a moment. He would have liked to tell Mac to get out, but he valued the friendship of this genial gasket salesman too much for that. Controlling his trigger temper, he said: "All right, come on down to the shop. I'll show you." Mac caught the emphasis on the last word. He thought a lot of the younger man but not much of his temper.

"Tommy!" yelled Gene as they arrived at the cluttered machine shop. "Where in thunder is that lazy kid?" A tall, lanky youth, obviously afraid of his boss, appeared on a run. Mac, smiling at him, spoke before Gene had a chance.

"Hello, Tommy," he said. "I'm Mac. Will you show us how you tested those quick opening valves. I hope you still have some of the new ones that you haven't tested."

"Sure have," quickly responded the boy. "Just a second. I'll get them."

"Likely looking young fellow," remarked Mac as they waited. Gene's expression did not confirm Mac's opinion.

"Here they are," said Tommy, returning. "We just screw a valve onto this water line and put a nipple in the outlet." He started the valve on the dry thread of the pipe, and when the going got hard, he picked up a wrench. Applying it to the outside end nut, he gave it a hard twist. Then he gave it another, to bring the valve upright. Screwing a nipple into the outlet, he tightened it unnecessarily hard with the wrench. After closing the valve with a bang, he went to the other end of the bench and turned on the water.

Mac watched the procedure thoughtfully but did not say anything. Gene was clearly impatient with the whole thing. Tommy hurried. He opened the shop door and grabbed the valve handle.

How Much Pressure?

"How much pressure have you got on that line?" asked Mac, as he stepped out of the way.

"About 100 pounds," replied Tommy, as he snapped open the valve. There was a flow of air, and then a stream of water shot across to the door and out into the yard. Bang! The valve was slammed shut, and the flow stopped. Without giving the nipple time to drain, Tommy opened the valve again with a snap. The stream was like a fire hose this time. Bang! The closing valve jumped, and the entire pipe structure kicked like a mule. Tommy grinned — he was having fun. Once more, he snapped open the valve and water shot across the shop. Bang! It happened again with the same result. This time, however, the flow did not stop. There was a sizable stream from the end of the nipple.

"That'll do, Tommy," said Gene. "See what I mean, Mac? Close that valve three times and it is shot. We can't use stuff that goes to pieces like that."

Mac Does It the Right Way

"Brother!" exclaimed Mac. "I never saw a more perfect way to wreck valves. You fellows don't do half a job when you get started." Mac was deliberately sarcastic. "Tommy, take that valve off and give me a new one. I want to show you something." While the boy worked on the valve, Mac removed his coat and ignored Gene to find a place to hang it. Rolling up his sleeves, he came back. "Now, Tommy, have you got some pipe dope and some waste?" he asked.

He took the pot of gummy paste that Tommy handed him, examined the thread on the pipe doubtfully and then carefully applied some of the dope to it. Unwrapping a new valve, he slowly opened it. Blowing out any dust that might be inside, he screwed the valve carefully onto the lubricated thread until it nearly covered the threads. With a monkey wrench on the near end nut, he gently brought the valve to an upright position with a little more than half a turn.

Lubricating the nipple thread sparingly, he inserted it into the valve outlet and firmly but slowly tightened it, saying to the boy as he worked, "Tommy, never put a wrench on the outside nut of a valve when you are making it up. The body is built to take inside pressure but is not intended to resist the kind of twisting strain that you were giving that other valve. Always apply the wrench on the near side nut and be sure that the wrench jaws are flat against the nut. When you turn it, give it as even and steady a pull as you can." Mac straightened up and looked over the job. "Now, Tommy, turn on the water."

Gene and Tommy had watched Mac with skeptical interest, saying nothing. Tommy did as directed and came back with a puzzled look on his face. Mac took the handle of the valve and lifted it slowly. Air blew out of the partly opened valve. When a steady stream of water appeared, Mac very slowly closed it. There was a gentle jar as it seated. Opening it with a snap, he watched the water until it flowed steadily, then he very slowly closed the valve again. This time the jar proved more violent. Repeating the performance in exactly the same way several times, he finally left the valve closed. In a moment the drip from the nipple stopped. The valve appeared to be tight.

"We can't use it that way," declared Gene emphatically. "Those valves have to close with a snap. We never would get any production that way. We can't baby them the way you do."

How Are These Valves Used?

"What do you use these valves for?" asked Mac.

"The air cylinders on the presses," answered Gene.

"Then, why test them with water?" Mac wanted to know.

"That's what is always used, isn't it?" Gene seemed puzzled, not knowing what Mac was getting at.

"No, Gene." Mac shook his head. "If you intend to use these valves on air, why don't you have them specially tested for air. The factory regularly tests them with water as you suggest but will give them an air-under-water test for little more than you pay for the stock valve if they have not already been tested that way. That way you'd be sure they were tight." Mac caught a funny expression on Gene's face and grinned. "Excuse me. I forgot that you don't trust the factory." Gene's temper started to go into high, but Mac held up his hand.

"Hold it, Gene. Look, I'm going to wreck this valve." He snapped it open. When the flow was full, he banged it shut. Once more it came open and shut. A third time completed the destruction. When it was closed, the water still ran out in more than a trickle. Unwrapping a third valve, Mac placed it along the one on the pipe. The destroyed valve was perceptibly longer. "Do you see that, fellow? That valve has actually been stretched by your kind of abuse."

"Just what I've been telling you," declared Gene heatedly. "The darn valves are no good. That proves it." There was a satisfied look on his face.

Valve Was Wrecked by Abuse

"Will you listen a minute?" demanded Mac. "That valve was wrecked by abuse. When you opened it, you let the water out to the atmosphere and it reaches a very high velocity. Tommy says that there is a pressure of 100 pounds on that water. It's going a mile a minute when you slam the valve shut. Do you think that the water is going to stop instantly? It's like an automobile going at high speed and hitting a bridge pier. Something is going to give. Now, if you wanted to sit down and do some fancy figuring, you could calculate reasonably close what force you applied to that valve when you banged it shut against that flow. You'd be surprised at the answer. The marvel is that the valve did not split wide open, because that water is as solid as a cannon ball. When I closed it slowly, the shock was reduced because the water slowed down gradually."

"Then why do they call it quick opening? The catalog says to close it with a snap action and lots of force." Gene refused to give up.

"If you'd read the catalog carefully, you would find that the valve maker has taken special care to warn you of what will happen when you do not provide a means of taking care of the velocity head if you close the valve suddenly on a fast moving liquid. It's not only these little quick opening valves that are affected, but often large valves as well."

"Then why haven't we had this trouble with the valves on the machines?" asked Gene peevishly.

"Don't you see, Gene? You are using them on air. There is no perceptible shock produced when you stop the flow of air because it is a compressible fluid. It is not like water. Don't confuse the two."

"I suppose, then, that all that we can do is to put the valves on the machines and take a chance that they will be tight." Gene found it hard to give up.

Test the Valves This Way

"No," replied Mac, "just fix up this testing rig with an air chamber of some sort to absorb the shock. That's all you have to do. It's very simple. Put a 1 in. tee in your line near the end. Use a nipple and a reducer with about 1 or 2 ft of 2½ or 3 in. capped pipe on top of it. Then you are all set. When the valve closes, the surge of water will back up into the air chamber, compress the air and the blow will be absorbed. As the flow stops, the air will again expand and equalize the pressure. You'll find that the valves are tight, and you will stop destroying them."

"Mac, I wish I knew more about some of these things. Maybe we're getting into the same kind of thing with those relief valves," Gene said ruefully. "Gosh, I know how to cure plastics, but I never was a pipefitter. I guess I'm too old to learn now."

"Not at all," laughed Mac. "All you need to do is to read your valve catalog carefully. It amazes me how little people appreciate all of the research and effort that the valve manufacturers have put into their catalogs. A thorough study of one of these books is a liberal education. Why not try to get some of it? Now, let's see those other valves."

Gene led Mac to the other end of the bench where a sort of Christmas tree piping arrangement had been set up. There were three ¾ in. brass relief valves on short nipples and three nipples sticking up from which the valves had been removed. Mac picked up one of the valves lying on the bench. Looking into the outlet, he examined the interior of the valve, paying special attention to the edge of the disc. Turning to Gene, he closed one eye and said, "So you use these valves on air too, do you? I see you're testing them with air. Tommy, bring me that monkey wrench and a pair of pliers."

Something Wrong Here, Too?

"Something wrong here, too, I suppose?" inquired Gene.

"Plenty," replied Mac. "Wait, I'll show you." He put a nipple into the outlet of the valve, set the nipple into the pipe jaws of the vise, and tightened it up. "Tommy, never clamp the body of a brass valve into a vise." he said. "You can distort the body enough to ruin the valve without realizing it. Now, let's have those pliers."

Pointing to the little nut on the back of the valve, he said, "That's the locking plug for the adjusting ring which determines the blowdown. When you start to loosen a nut, be sure you have a firm grip on the flat of the nut and not on the corners. Press evenly on the pliers until you have a good load on the nut, and then give a little jerk, like this, and she's loose. Brass parts are soft compared to iron or steel and must be handled with care." Both Gene and Tommy were all attention as Mac quickly and expertly relieved the spring load and dismantled the valve. When he had it apart, he took it over to the door and, pointing to the seating surfaces, he observed, "Look at that pipe dope on the seat and disc."

Mac wiped the seat with his finger and examined the smudge. "This is a flake graphite dope. Plenty of it got on these seating surfaces, too. It's no wonder that these valves leaked. No air relief valve will be tight with graphite flakes and dirt on the seating surfaces." He looked thoughtfully across the yard. Turning to Gene, he said, "Gene, I suggest you send these valves back to the factory and ask them to clean them for you."

"They better clean them, or else." Gene's wrath exploded instantly.

Put Dope on Male Threads

"Hold on, Gene." Mac held up a cautioning hand. "Where do you think this dope came from? Looking at that rig of yours, I'd say right here. Come here, and let me show you why." He was still carrying the valve parts. Turning over the valve body, he said, "Look, do you see that rim of black dope inside this valve inlet? That was forced into the valve because the dope was applied on the female thread of the valve rather than the male thread of the nipple." Turning a kindly eye on Tommy, he emphasized his remarks with a vigorous poke of his finger. "Never, and I mean never, apply any kind of lubricant to a female thread. Always put it on the pipe thread or a bolt thread. That way you avoid forcing any of the lubricant inside the pipe or valve."

He pointed again to the inside of the valve. "Here you have put the dope where the air picked it up and carried it right on to the seating surfaces the moment the valve opened. The damage was done right here."

Grinning at his friend, he said, "Gene, I'm afraid you're the goat. It won't happen again, will it Tommy?"

"I'll say it won't. Not if I do the job," replied the youth earnestly. Gene was left holding the bag. Mac smiled at his discomfort.

"So long, Tommy," said Mac as he wiped his hands and put on his coat. "Don't forget what I've told you. You'll learn in time." He gave the boy's shoulder a gentle shake, as he turned away with Gene.

As they left the shop, Mac said thoughtfully, "Gene, these days the young fellows just don't get training. They are told to do something and then left to their own devices. It's as if people imagined that they were like animals or birds and had the instinct to do the right thing. I'll be forever grateful to the old man who pounded knowledge into my thick skull."

"I agree with you, Mac. My maintenance crew is busy every minute — they just don't have the time. I sometimes wonder how much they know, when you consider some of the things that happen around here. I'm sure I don't know what to do about it."

"I don't know either, but I do know that the problem is becoming more serious all of the time," replied Mac.

"Well, Mac, thanks a lot for saving me a lot of painful embarrassment. I guess I'll have to take it on those relief valves." Gene offered Mac his hand, as he smiled.

"We all learn the hard way, Gene," said Mac smiling. "Why not develop some faith in the people that you buy from. Study their literature and don't jump to the conclusion that they are trying to put something over on you every time that you get into trouble. Give them the credit of being at least as honest as you are. So long."

"So long, Mac. I'll try to remember that," said Gene.

Leak in School Hot Water Pipe Found With Detector

A BREAK in a hot water pipe caused the Spring Ave. school, La Grange, Ill., to close six hours prematurely one recent Friday. However, because of an electronic leak detector, school was opened the following Monday on schedule.

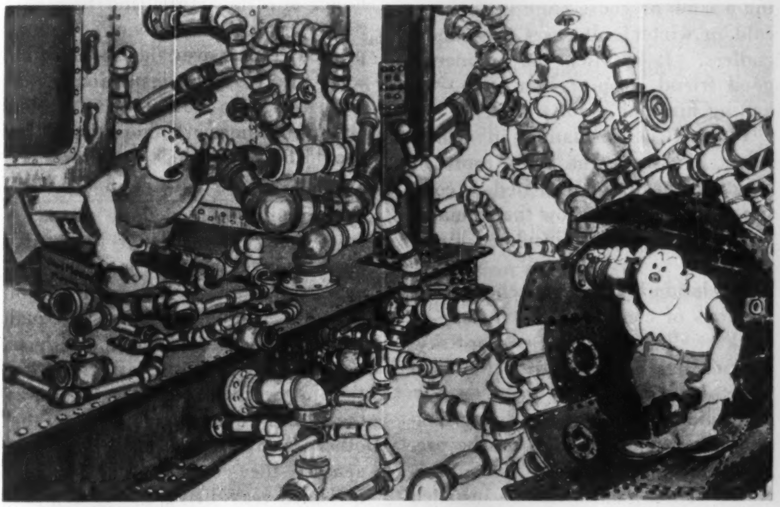
The school is built upon a concrete slab floor and the piping from the boiler to the unit ventilators in each room is embedded in the slab. Water leakage was apparently the cause of falling temperatures on the Thursday before when all of the classes were forced to meet in the school's art room which was warmer. On Friday, the source of the trouble was still a mystery and since the classroom temperatures were in the low 60's, it was decided to close the school with the hope that the trouble could soon be discovered.

To find the broken pipe, it was decided to enlist the services of a local engineer who had an electronic leak detector. Using a microphone and a set of earphones, he painstakingly worked his way across the floor of each classroom until he could accurately estimate the location of the bad pipe. He explained that the microphone, placed against the asphalt covered concrete floor, picked up the high pitched sound of water gushing forth from the faulty pipe, once he reached the vicinity of the leak.

Because of the accuracy of locating this leak, only a 16 in. hole had to be cut in the classroom floor.

Poke Fun at Themselves, Their Customers

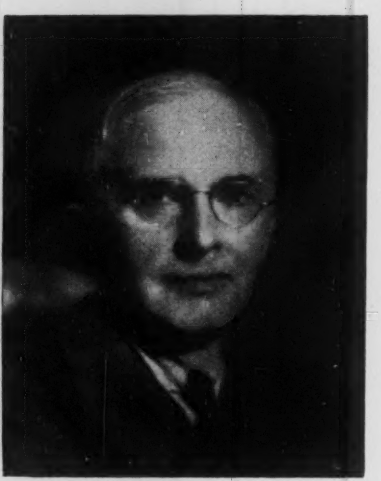
ORDINARILY, IT'S not considered good business for a business to poke fun at itself and its star employees — to say nothing of ribbing its customers. But Minneapolis-Honeywell's industrial division customers and employees are lampooned every workday of the year via the Brown calendars, a cartoon calendar put out by the division once known as the Brown Instrument Co. Shown here is the October 1954 cartoon.



"Testing, Testing — 'What Hath God Wrought?'"

SAM LEWIS' PAGE

Insulation Is My Friend



SAMUEL R. LEWIS, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors, comments informally each month on practical heating, piping and air conditioning problems. This month, he notes some of the points he covered in speaking before a recent meeting of manufacturers of insulation

INSULATION performs many functions and has many applications — keeping heat out or in, stopping noise from bothering people, preventing unwanted condensation . . . . or keeping a lamb or goose from getting too cold in winter! Its uses are almost endless. It is often the engineer's good friend, keeping him out — or getting him out — of trouble.

I think of insulation in winter when I observe the bare roofs of buildings that aren't insulated, as compared to the white snow that remains on the roofs of well-insulated structures.

Insulation is helping to change our methods of construction. Instead of thick walls of masonry for skyscraper buildings, we give the steel skeletons a skin made up of an outside epidermis of water-resisting metal (with insulation) that can be prefabricated and fastened in place in sections. These panels can be installed at the rate of a block square story in one day. The overall heat transmission and air leakage in such a wall is far less than with one of more conventional construction.

Insulation in the Wrong Place

There is an occasional installation in which we should remove or omit the insulation! Each 500 hp water tube boiler in a large office building gave trouble because the brick encasement cracked, bulged and leaked. The steel buckstays were imbedded in the walls and the walls were covered with insulation so that both the walls and the steel became overheated. We removed the insulation, rebuilt the walls and gave the steel a chance to cool down to a reasonable temperature. The rebuilt walls have endured five years of hard service without any recurrence of the trouble.

Insulate Ceiling Over Boiler

We find on many jobs a too-warm floor of some important room above hot process apparatus, such as a boiler, an oven or an incinerator. Rather than do an insulating job on the ceiling below the room, there is a tendency to do a half-hearted job of insulating the breeching and the boiler and the piping and to ignore the overhead construction. A suspended ceiling over the boiler room, with fire resistant insulation as its facing, usually corrects this trouble. Of course, the space above the ceiling should be ventilated.

When we design a refrigerated air conditioning system, there are many cases where insulation is imperative — as under the drain pans that prevent the leakage of condensation from the chilled convectors. Usually, we insulate the air supply ducts, not only to keep the air from getting too warm but also to fend away the warm, damp, ambient air that otherwise would lay its moisture against the cool air ducts. This moisture may bring about dripping and rusting and do destructive and costly water damage to the materials under the duct.

Natatorium Needs Insulation

Whenever we design a natatorium, we cannot pay too much attention to the insulation of the walls and ceilings. When these walls and ceilings are exposed to cool outdoor air, they often reach the dew point temperature and become dripping wet. I know of several large swimming pool rooms where the overhead structural steel — not properly insulated — rusted and corroded so greatly that it lost its strengh.

One big high school sent for me to help their problem of alleged roof leakage above the natatorium. When I inspected the room, it was unoccupied. However, the water in the pool showed constant irritation from drops of water, falling intermittently here and there.

A suspended ceiling had been installed below the trusses. The joints in it were like sieves, so that the highly humidified air of the swimming pool room leaked into the relatively cool attic and condensed against the roof. The result was a miniature rain storm.

In this case, the easiest and quickest remedy was to install some recirculating unit heaters in the attic until the following summer. At that time, the room could be scaffolded and an airtight and properly insulated ceiling could replace the original one.

Insulate Steel Warehouses

We have as a permanent client the sales outlet for a large manufacturer of steel sheets and structural shapes. There are thousands of square feet of piles of steel under great parallel craneways, all covered by buildings that have glass walls and reinforced concrete roofs. Originally, these buildings were not heated. There are large doors for trucks and freight cars. If the weather had been chilly, so that the thousands of tons of metal became cold, and then if the outside temperature warmed up, the air that drifted in would cool to its dew point temperature against the steel. I have photographs of the piles of steel coated white with frost. This frost thaws to water eventually, the steel gets rusty and of course then it is not satisfactory merchandise.

I installed steam pipes laid horizontally in one warehouse, close to the floor under the steel. The steel was supported on transverse wood and concrete bulkheads. By this scheme we could keep the steel above the dew point temperature at less cost than that required to heat the enormous room. Unfortunately, the cranes would occasionally drop some heavy load, miss the bulkheads and smash the steam pipes.

Eventually, we proved that it would be wiser to insulate and then heat the warehouses. The original glass walls were full of leaky windows, and the heat transmission through the uninsulated concrete roofs was terrific. We installed a level suspended ceiling above the cranes, leaving an attic between the ceiling and the pitched roofs. The ceiling was made of 1 in. insulation, prefabricated in squares of about 400 sq ft. These squares were hoisted into place rapidly. The windows were fitted with storm sash, though in the new bays electric lights were used and the windows were eliminated.

Now the steel does not rust and the big rooms, heated by recirculating fan equipped unit heaters, are cool enough so that men can work happily but are warm enough so that the steel does not reach the dew point. Since we of course have no swimming pool in a steel warehouse to humidify the air, and have a rather tight ceiling, the trusses above the insulated ceiling do not become rusty anymore.

QUESTION OF THE MONTH

What Absorbs the Movement of Heating Risers?

- *IF YOU DON'T HAVE the answer to a heating, piping or air conditioning problem, chances are someone else does — or can be helpful on part of it. That's the reason for HPAC's Question of the Month "idea exchange."*
- *YOU ARE INVITED to contribute a question for publication, or an answer to a published question. Please address your reply to the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.*

SEVERAL REPLIES to the question What Absorbs the Movement of Heating Risers?, recently published in HPAC, have been received and are presented this month. Here's the question:

"In a steam or hot water heating system, especially in high buildings, the movement of risers up and down is absorbed in the connections to the radiator (or convector). This is the usual '3 elbow' connection, ordinarily ½, ¾ or 1 in. pipe, as per Fig. 1. How is this movement absorbed—by the threads of the fittings turning or by the pipe between elbows bending? What is the minimum length of "A" in relation to riser travel?

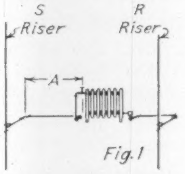


Fig. 1

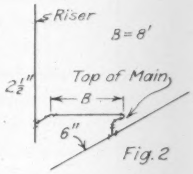


Fig. 2

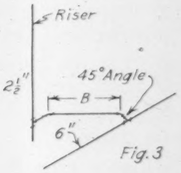


Fig. 3

"Take larger pipe. We have a 6 in. steam main in the basement with 2 in. and 3 in. branches to the bottom of risers. These branches are, say, 8 ft long, taken off the top of the main or at a 45 deg angle, the bottom of the riser having a tee, nipple and elbow as per Figs. 2 and 3. Does the pipe "B" bend or do the fittings turn on their threads?

"I have asked this question of dozens of competent and experienced men. Half say the threads turn. The other half say the pipe bends and that, if the fittings turned on their threads, you'd have a leaky joint in short order.

"Does anyone have conclusive proof of what actually happens, gotten by accurate observation under job conditions?"

ACCORDING to William W. Murray, Jr., Almirall & Co., Inc., the movement in the riser in each of the examples is absorbed by the spring or bending of the pipe in the runout between the riser and the radiator in the one case — and the main and the riser in the other two.

If the runouts were too short in any of the examples, either the pipe would turn in the threads and leaks would develop, or the fittings might break, he says.

READER ASKS —

Where Can I Find Information on Cost of Heating and Air Conditioning All Types of Buildings?

"We are looking for published information on the cost of heating and air conditioning all types of buildings in all parts of the U. S. Could you inform me where such data may be found?" — E.B.L.

[You are invited to comment on this question, giving actual examples if possible. Address the Editors, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2].

A READER with the Flexonics Corp. says that "the really pertinent comment we can offer in connection with the inquiry is that if either the steam or hot water systems mentioned were properly equipped with the right type of expansion joints the troubles outlined would disappear. There would be no pipe bending or loosened threads, and therefore no leaks.

"The answer to the first paragraph in the explanation of the question — in the absence of expansion joints — is simply that the minimum length of "A" in relation to riser travel depends upon the distance between floors and the temperature of the water or steam.

"The answer to the second paragraph is fairly obvious. If the force necessary to bend the pipe is less than that necessary to loosen the fittings, then the pipe will bend. The opposite is also true."

THE THEORY that the threads turn is wrong, according to George P. Nachman, of the Spohn Heating & Ventilating Co. The pipe bends, and if there is not enough pipe, the fittings break, he states.

ROBERT LEILICH —

"What's the Possibility of a Coil Freeze-Up?"

THIS IS with reference to the article by W. A. Stahl on preventing freeze-ups of cooling coils in the Question of the Month department of the December HPAC.

Mr. Stahl's relation of the several methods of attempting to prevent freeze-ups is interesting and informative. However, his explanation of the best solution involving the heat exchanger brings to my mind the question of the absolute safety of this recommended solution. Though the water is safely kept above the freezing point by the addition of heat, I keep thinking of the analogy of an automobile radiator where a heat source is likewise present, but when temperatures are sufficiently below freezing, the system will nevertheless freeze. I should like to know, if under certain circumstances, how this would be prevented with the use of this heat exchanger as explained by Mr. Stahl.

It will be appreciated if you can enlighten me on the possibility of a freeze-up such as I suggest. — ROBERT LEILICH, Baltimore office of The Trane Co.

MR. STAHL offers the following reply:

Mr. Leilich is probably quite right that there is some analogy to the freezing of an automobile radiator — even though the motor and pump are operating. I believe when this happens with the automobile radiator, the condition is often encouraged by dirt in the radiator impeding the flow. Also, with the automobile radiator, there is usually a thermostat in the line which sets up an obstruction to the flow until the water heats up so that, unless the thermostat is taken out or changed in the winter, it can often be the cause of the freeze-up in a radiator.

The circulation of chilled water only would — in some cases — lead to a freeze-up of the coils, especially if the coils were clogged with scale so that the flow is impeded. We have minimized the incidence of clogged coils at the Merchandise Mart by the large scale traps which have been installed. Incidently, the article in the December HPAC gave the size of these traps as 24 in. x 8 in. This was an error and should have been 24 in. x 8 ft.

We do not depend solely on the water circulation to prevent freeze-ups. We also have a control on the preheat coil which puts on the steam just as soon as the temperature goes below 35 F.

With both of the safeguards mentioned, we still have several coils in the building which — because of the particular conditions of the installation — we feel might freeze. In these cases, the coils are drained and an antifreeze solution is pumped through. — W. A. STAHL, Operating Manager, The Merchandise Mart.

W. C. RICHARDS —

"More Information on Skating Rink Problem"

AFTER MY QUESTION and the comments offered by C. T. Baker regarding the solution of the outdoor rink problem was published in the February HPAC, some additional information can now be provided. Mr. Baker indicated that it would be helpful if the temperatures and pressure of the brine circulating in the coils were known. The rink is 85 x 185 ft in overall dimensions.

The temperature of the brine entering the coils is 15 F, and leaving the coils it is 16 F. The pressure on the brine being circulated is 16 psi. The coils are 1¼ in. black iron pipe, and they are spaced on 4 in. centers. The coils are in 2 in. of gravel fill and 2 in. concrete is over the fill.

Expansion joints, made of copper, were installed when the slab was poured at a distance between 8 and 10 ft apart lengthwise of the rink. The expansion joints are centered between the coils, so the distance between them is about 1¼ in. The copper expansion joints do not extend to the top of the slab, so the joints have been filled with cold tar and painted with aluminum paint.

There is a small building at the west end of the rink that shelters the refrigeration equipment. There are two compressors — one driven by a 40 hp motor and the other by a 100 hp motor. A total of 94 tons of refrigeration capacity is available.

The problem is that the ice melts over the expansion joints near the shelter in mild weather — when the outdoor temperature is 40 F and higher. When the outdoor temperature drops again, the water will freeze on top but not all the way through. No doubt it freezes some on the bottom which leaves water between two layers of ice. As soon as skaters pass over these expansion joints, the ice breaks. We have lowered the brine temperature to zero F, but it has not helped any.

I hope that with this additional information Mr. Baker and others will send any suggestions that they may have for correcting this situation. — W. C. RICHARDS, Formerly Chief Engineer, Phillips Academy.

Air Conditioning Is Great Growth Industry

. . . 1.2 million units this year

AIR CONDITIONING is one of the great growth industries of our time, said James H. Carmine, executive vice-president of the Philco Corp., before a midwinter convention of 1200 distributors and distributor salesmen in Atlantic City. "We believe that sales of single room air conditioners by the industry will increase 50 percent to approximately 1.2 million units this year. Philco expects another very substantial increase in air conditioner sales," he continued.

THE LAW AND YOUR PROFITS

Contractor Almost Loses Lien

OPTIMISM is a good thing, providing that it does not blunt one's keen perception of need for care in the matter of legal this-and-that. The following actual case — wherein the names are disguised — provides an example not to be emulated.

Welbred Baking Co. — a man-and-wife partnership — entered into a written contract with A. Phitter, who also had his spouse as a partner under the unregistered trade name of Phitter Equipment Co. The contract called for installation by Phitter of an air conditioning system in the bakery building and the erection by Welbred of a partition between the retail section and the bakeroom in the rear.

Phitter Corrects Complaints

Phitter commenced work in June and fully completed the job during September, but Welbred never put up the partition. When in July the air conditioning system was given a test run, it was evident that the air was being delivered through the supply outlets at too high a velocity. The Welbreds registered complaints and ordered Phitter to take the system out. Instead, Phitter set about remedying the malperformance, which he succeeded in doing about the first of September.

William Hurd Hillyer, author of this article, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president of the Atlanta Trust Co., his work there gave him a practical legal background.

More trouble arose in November when the heat was turned on. It was then discovered that the system failed to drain off the steam condensate. This defect — as well as a deficiency in the water capacity — was corrected by Phitter after he was notified. Apparently, after that the system worked adequately. Nonetheless, the baking firm remained discontented and refused to pay Phitter's bill.

Mechanic's Lien Filed

Phitter filed a mechanic's lien on the property for the principal sum of the contract. He testified that (a) during July the installation was practically completed; (b) the only tests then made were to determine whether the motor was operating properly; (c) no one at any time complained about the air coming out with too high a velocity; (d) final tests were not made until some time in September; (e) during that month when complaints were voiced, they were all properly adjusted. Phitter, the air conditioning contractor, denied that the baking people had at any time expressed dissatisfaction with the system or told him to take it out.

The Welbreds, supplementing their contention that they had demanded the system's removal and had thereby rescinded the contract, attacked the mechanic's lien itself on technical grounds. The wife, Maria Welbred, though joint owner of the building, was not a party to the written contract on which the original lien papers were based. Furthermore, those papers failed to allege "the reasonable value" of labor and materials furnished. Accordingly, the Welbreds moved in the district court to dismiss the case, but the judge permitted Phitter to meet such objection by amending his papers.

Welbred contended that this "constituted the pleading of a new cause". More than one year having elapsed since the last item of labor and material was furnished, he maintained that the "new cause" was barred under the statute which required that lien foreclosures be commenced within a one year limit.

No Trade Name Certificate

The Welbreds went further. Seizing upon Phitter's failure to file a certificate of trade name for the "Phitter Equipment Co." before executing the contract, they sought to demolish his cause of action. Between the signing of the contract and the court trial, this lapse had been rectified. During the trial, when it was disclosed that Mrs. Phitter had not signed the contract, the trial court permitted Phitter, over Welbred's protest, to amend the title of his case by striking out the words "Phitter Equipment Co." from the "plaintiff's designation therein". This amendment, Welbred strongly urged, was a "circumvention" of statute and hence unauthorized.

Welbred, appealing to the supreme court of the state after losing the case in the lower court, contended that Phitter warranted: (1) that the air conditioning system "would keep the show windows in the structure clear of frost, moisture and steam" and (2) "that the installation thereof would be completed within a reasonable time from the date of contract". Both these warranties, the baking firm averred, had been breached by Phitter, thus relieving the Welbreds of any liability under the agreement. But no specific damages were alleged.

Phitter denied making such warranties and sought to show that, if the structure had been partitioned as agreed by Welbred, ice and heavy frost "would have been eliminated from the windows".

Four Reasons Cited

The supreme court took a serious view of the case and in a lengthy opinion set forth four principal reasons for affirming the trial court's decision in favor of the air conditioning contractor and letting his lien stand. In everyday language:

a) According to ample testimony, Welbred made no attempt to call off the contract for the air conditioning system prior to virtual completion of its installation.

b) Only a material breach of contract or substantial failure to perform justifies the party thereto in rescinding.

c) Under rules of civil procedure, Phitter's amendments were authorized because they did not alter the alleged facts, even though his claim thus asserted would have been barred by statutory limitations.

d) Though the title of the case incorrectly included the trade name hitherto unregistered, it was all right to delete such trade name because Phitter signed the contract individually without reference to any "equipment" business. Lien papers were individually signed by him and referred to him throughout as an individual only. Furthermore, the Welbreds "were in no way deceived, damaged or deprived of any of their rights" by reason of the case title's inaccuracy.

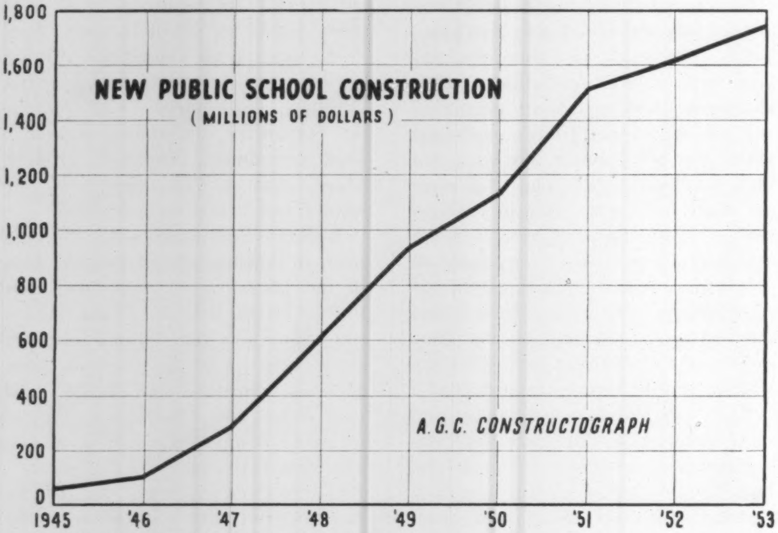
Phitter Was Careless

Phitter came mighty near losing his mechanic's lien and with it his entire investment in the Welbred contract by reason of his carelessness along legal and business lines. To begin with, he neglected to file the trade name under which he and his wife were doing business. Then he took on an air conditioning contract in his own name. When at length he had to sue for his money, he permitted his partnership trade name to appear in the title of the case.

As a result, to keep his case from being thrown out of court, Phitter had to rush to get his trade name registered, after which he succeeded in having it removed from the case title and his own name substituted. What was probably the main factor in saving his case was his manifest good faith throughout and his successful endeavors to make the system work satisfactorily, following Welbred's complaints. This diligence inclined the judges to help him correct his mistakes, but other courts might deal with him in a similar spot less favorably.

[Note: While this discussion applies to an actual case, it should be remembered that legal rules vary in different states.]

Many Factors Influence High Construction Rate



(DATA FROM U.S. DEPTS. OF COMMERCE & LABOR)

While major governmental and private forecasts have estimated that construction will experience its second highest year in volume during 1954, with the total tapering off slightly by only 2 to 4 percent, there are favorable factors present in the economy which suggest a potential sustained high rate, according to the annual construction review and outlook prepared by the Associated General Contractors of America.

Major favorable factors for the immediate future cited by the AGC include:

"1) The continuing high level of plant and equipment expenditures planned by business, projected into the first quarter of 1954 at near-peak levels of $28 billion per year.

"2) Booming commercial construction, which was held back by World War II and subsequent controls on materials and construction, and which was considerably underestimated during 1953.

"3) The increasing backlog of known planned construction projects.

"4) The trend of residential development in suburbs and outlying areas, which carries with it the demand for all types of construction needed for community facilities.

"5) Demonstrations in the November off-year elections, the last general elections, and by state legislative actions, of the public's willingness to authorize large bond issues to finance needed projects — especially highways, schools and sewer and water facilities.

"6) Good economic conditions in general, which, while tapering off slightly from boom conditions, show continued high employment and production, and peak income."

As long-range favorable factors, the association pointed to the need to tremendously expand construction of schools, highways and community facilities merely to catch up with present needs; the large population growth which is expected to continue at the rate of about 2.7 million annually for several years, underpinning the continual demand for more goods, services, housing, and all the other types of construction required; and the ever-unfolding "new horizons" for industry — such as plastics, chemicals, electronics, and expanding applications of atomic energy and its byproducts.

Recent history shows that construction activity has acted as a major "stabilizer" in the economy when declines in other segments caused a drop in the country's total production and business, the AGC says.

Electric Service for Air Conditioning Units

THE Union Electric Co. of Missouri recently conducted a series of promotional meetings for heating and air conditioning contractors, consulting engineers and architects, and mortgage bankers, FHA, VA and electrical inspectors, and representatives of real estate companies.

When the meetings were announced, M. E. Skinner, vice president and director of sales for Union Electric, stated that it was the company's experience that air conditioning units with power factors of less than 90 percent not only affect the quality of electric service, cause customer difficulties and unnecessary wiring expense in many cases, but also tend to limit the market opportunity for room and window air conditioners since so many buildings still have only two wire, 120 volt service.

A memorandum was distributed at the meetings providing information concerning electric service requirements for the proper installation of window and room air conditioning units. It is not intended to replace any instructions or procedures issued by manufacturers on the installation of their own equipment, nor does it supersede any utility regulations or inspection ordinances which may apply in certain areas or municipalities. It is intended as a guide. Pertinent parts are reproduced here:

Voltage Requirements

All units in excess of ¾ hp should be connected to 240 volt (or 208 volt) circuits. Units of ¾ hp and smaller may be connected to 120 volt circuits provided they are designed so that the starting inrush currents do not exceed 46 amperes for manually controlled units or 23 amperes for automatically controlled units, and further provided that the full load current is within the capacity limitations of the circuit on which the unit is to be operated.

Those room air conditioners with automatic temperature controls which stop and start the motors generally have starting currents in excess of the 23 amperes permissible for use on 120 volt circuits. This causes voltage fluctuation on the customer's service, undesirable light flicker and interferes with television reception. Unless the manufacturer supplies a starting current limiting device to keep the starting current at or below 23 amperes for 120 volt operation, such units should be purchased for 240 or 208 volt operation. When the only service available is 208 volts, consult the manufacturer of the equipment regarding the proper motor to supply, as a standard 230 volt motor may not give satisfactory performance.

Circuit Requirements

Be sure the electrical circuit is adequate and safely protected. Overloaded wiring is a potential fire hazard. Phantom testers, which approximate the effect of the room air conditioner, are available for obtaining a voltage indication without connecting the unit.

Attention is directed to the fact that the National Electrical Code, Paragraph 2125A — Motor Operated Appliances states: "The total load shall not exceed 80 percent of the branch circuit rating if motor operated appliances are supplied."

Room air conditioners of ¾ hp or less can usually be installed on existing 15 ampere general purpose circuits if they are equipped with motors to operate at 90 percent power factor under full load conditions, provided the total load on the circuit including the full load running current of the room air conditioner does not exceed 12 amperes.

Motors 1 hp and larger will always require heavier wiring and should be installed on 208 or 240 volt circuits. Exceptions to this are those units which have twin half horsepower motors instead of a single 1 hp motor. Such units, if the power factor is acceptable, will operate satisfactorily on a 15 ampere, 120 volt circuit provided the total load on the circuit including the full load running current of the unit does not exceed 12 amperes; or on a 20 ampere, 120 volt circuit, provided the total load on the circuit, including the full load running current, does not exceed 16 amperes.

Need Better Power Factor

Many room air conditioners now on the market have power factors of 70 percent or less. The growing use of these low power factor room air conditioners is resulting in needlessly overloading customer and company circuits and facilities and is resulting in low voltage conditions at the unit which give rise to customer dissatisfaction with room air conditioners and to increasing service problems.

Service rule No. 2.21 of the electric service manual for the Union Electric system states:

> "All lighting equipment, motor driven equipment and appliances shall have such characteristics or be equipped with corrective devices so as to enable the company to maintain a satisfactory standard of service. In the case of low power factor, high motor starting current, violently fluctuating loads, etc., the company reserves the right to require customer to install, at his own expense, apparatus to correct the objectionable condition.
>
> "The company will be glad to cooperate and supply engineering advice without cost to find a satisfactory method to correct such unsatisfactory and disturbing conditions."

The combination of low power factor and lack of diversity in the operation of room air conditioners is adversely affecting the quality of the company's service, and the company is, therefore, notifying air conditioning manufacturers that units with full load power factors below 90 percent do not fall within the requirements as stated in service rule No. 2.21 quoted above.

Interim Policy

The company realizes that until the manufacturers take steps to improve the performance of motors used in their room air conditioners, or to provide self-contained capacitors for power factor improvement, few present models will meet the foregoing requirements. Therefore, enforcement of this service rule will be postponed with respect to air conditioning equipment until suitable designs become generally available, but not beyond January 1, 1955.

There are certain definite benefits which will accrue to the industry as a result of manufacturers taking steps to provide equipment that will conform to the foregoing electric service requirement; namely, the following four benefits to the customer:

1) Improved voltage at the appliance outlet resulting in better and more efficient operation of the room air conditioner and better television reception.

2) Possible avoidance of additional wiring costs. This would be due to the fact that manually controlled room air conditioners with starting currents of 46 amperes or less and running currents of 12 amperes or less could be connected to existing 15 ampere, 120 volt branch circuits; and manually controlled units with starting currents of 46 amperes or less and running current of 16 amperes or less could be connected to 20 ampere, 120 volt branch circuits and still be in compliance with the provisions of the National Electrical Code.

3) Ability to carry some load in addition to room air conditioners on such 120 volt circuits.

4) Reduced electrical loss in wiring.

Also, there are the following six benefits to the manufacturer, distributor and dealer:

1) Increase in number of sales that can be made as a result of fewer wiring changes being required.

2) Increase in customer satisfaction with the product, enhancing the manufacturer's reputation and prestige and bringing repeat and customer referred business.

3) Decrease in service calls and reduction in calls which are not the fault of the equipment itself.

4) Reduced possibility of claims and damage suits.

5) Increase in profits as a result of more sales, fewer complaints, less returned merchandise.

6) Higher sales ticket prices. Power factor correction embodied in the unit will be sold at a profit instead of forcing others to furnish it or the customer to provide special circuits and other wiring changes.

Prompt Action Urged

Union Electric offers these recommendations "in the interest of expanded market opportunities for air conditioning manufacturers, distributors and dealers, and customer satisfaction with the performance of room air conditioners."

Pending the accomplishment of this objective a much higher percentage of sales will require the installation of special branch circuits by the customer. It is well to inquire at the time of a sale about the customer's wiring and encourage him to correct inadequacies prior to installation.

Union Electric plans to render every possible assistance in meeting this problem. The company will:

a) Urge manufacturers to improve the performance characteristics of their products and to provide adequate information on the nameplate so as to facilitate proper installation.

b) Assist distributors and their dealers with the problems presented by the known performance characteristics of present designs.

c) Furnish information to customers and others so as to encourage full understanding of the problem and cooperation in solving it.

Heating, Piping & Air Conditioning

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

JOURNAL SECTION

Computation Charts and Theory for Rectangular and Circular Jets

By Harold G. Elrod, Jr*., Cleveland, Ohio

SUMMARY — This paper presents three computation charts giving center velocities, entrainment ratios and velocity distributions for jets emitted from circular sources, and from rectangular sources of all aspect ratios. Continuous, quantitative information is provided for all zones of the jets, with the exception of the terminal zone. The correlation incorporated in the charts is based on Reichardt's[1] free-jet theory, and is accomplished with the use of only one adjustable constant. The basic theory is outlined, and supporting experimental evidence is presented.

A CONSIDERABLE body of experimental information is now available concerning the velocities in fluid jets having discharge openings of various shapes. For the designer of systems employing jets, it is very desirable that this information be correlated in a compact, accurate, and simple manner. Although considerable success has already been achieved in the making of such correlations, it is believed that the present correlation based on Reichardt's[1] free-jet theory is more satisfactory than any heretofore obtained. This correlation has been incorporated in the charts given in Figs. 1, 2 and 3. These charts are substantially independent of the accompanying text, so that the reader, if he desires, may apply them immediately for his own purposes.

The theoretical basis for the present work lies in the free turbulence equation of Reichardt (Equation 1). Although not as well founded in basic fluid-mechanical hypotheses as the formulations of Prandtl and Taylor, this equation gives rather better agreement with free-jet experiments and is, furthermore, much more susceptible to mathematical analysis. Being a linear equation, it yields results for finite sources and for simple multiple-jet systems by the method of superposition. Since it can correlate a wide variety of known jet phenomena by means of a single empirical constant, it may be used with reasonable confidence to interpolate or extrapolate to unstudied situations. However, it is known that Reichardt's equation is not applicable when static-pressure variations within the jet are appreciable.

Many experimenters have corroborated the following three observations concerning free jets:

1. The momentum of a free fluid jet is approximately conserved. That is, external pressure and viscous effects are generally negligible.
2. At distances z remote from the jet-source, the momentum flux (ρw^2) distribution as a function of displacement r from the jet axis is well approximated by the Gaussian error curve.
3. A free jet spreads with a nearly constant angle of divergence.

The foregoing observations lead uniquely to a momentum-flux distribution which is identical in mathematical form to temperature distribution resulting from the diffusion of heat from an instantaneous line source of energy in an infinite, conducting medium. In the first instance it is momentum, and in the second instance it is energy, which is conserved. Because of the similarity, Reichardt hypothesized that *momentum diffuses with distance from a source in the same manner that heat-energy diffuses with the square-root of time.* This simple correspondence permits an attack of problems in jet propagation by use of accumulated experience in heat conduction. In particular, known solutions from this well-established field can be borrowed to provide directly the characteristics of a variety of fluid jets.

The differential equation for free

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[1] Exponent numerals refer to References.

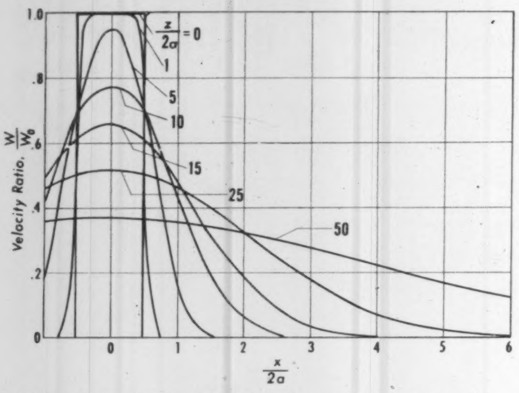

Fig. 1—Velocity profiles for the rounded infinite slot

turbulence follows naturally from Reichardt's hypothesis. Thus, by analogy with the well-known equation for heat conduction, Equation 1 may be written:

$$\frac{\partial \rho W^2}{\partial (z^2)}=\frac{c^2}{4}\left[\frac{\partial^2 \rho W^2}{\partial x^2}+\frac{\partial^2 \rho W^2}{\partial y^2}\right] \text{--------(1)}$$

Symbols used in Equation 1 and following equations are defined under Nomenclature.

This differential equation forms the basis for all the theoretical results given in this paper. It also furnished the starting point for the recent work of Alexander[2] in which the theory was shown to reproduce satisfactorily the velocity field near the outlet of a circular nozzle.

Computation Charts and Their Limitations

Fig. 1 shows the velocity profiles generated by a rounded-entrance, infinite slot. The reader may observe here in a semi-quantitative manner the dissolution of the original *platform* profile into the customary Error Curve. The series of profiles expresses the following relation, which must be used if considerable inaccuracies from interpolation are to be avoided.

$$\frac{W}{W_o}=\sqrt{\frac{erf\left(\frac{a+x}{cz}\right)+erf\left(\frac{a-x}{cz}\right)}{2}} \text{----(2)}$$

In this equation W_0 represents the peak velocity of the source. The function "erf (x)" is the Probability or Error Integral, and is tabulated in many places, such as, for example, Reference 3.

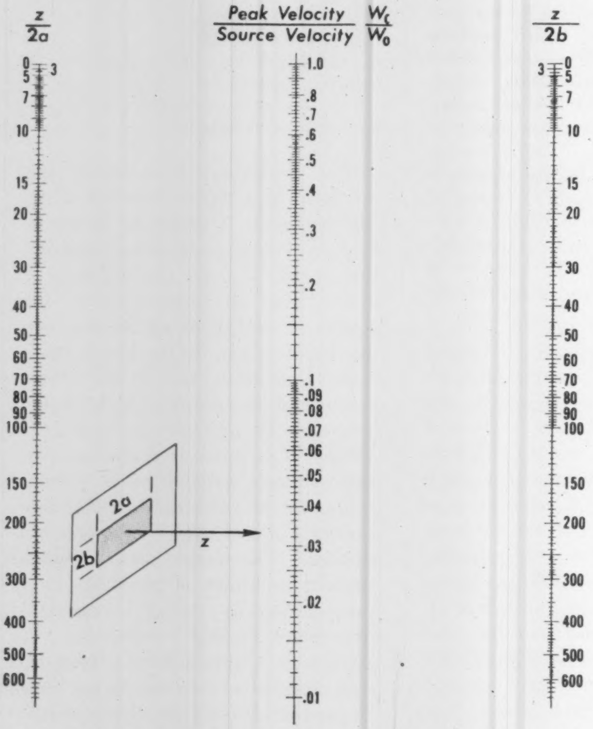

Fig. 2—Nomogram for center, or peak, velocities for rounded, rectangular jet sources

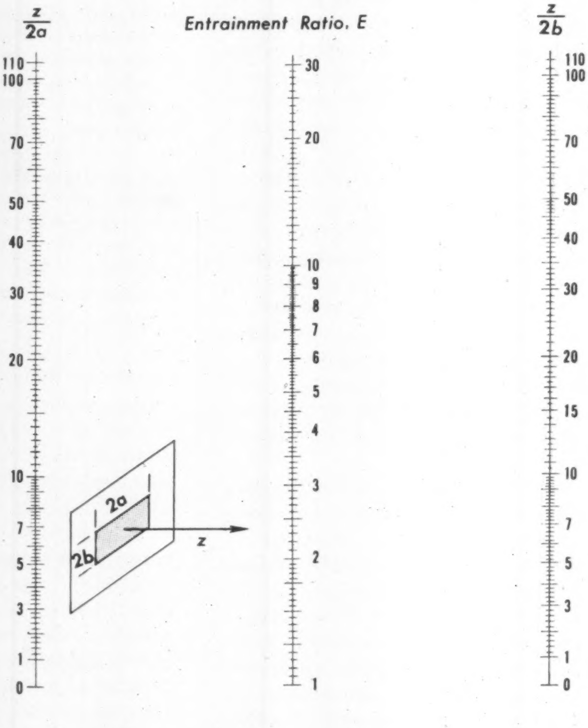

Fig. 3—Nomogram for entrainment ratios of rounded, rectangular jet sources

Nomenclature

A = cross-sectional area of region through which jet is passing, square inches,† dimension L^2.
a = half-width of infinite slot, inches,† dimension L.
b = half-width of infinite slot, inches,† dimension L.
c = empirical constant in Reichardt's turbulence Equation 1.* Approximate value: 0.08.
C_d = discharge coefficient of jet aperture.*
D = diameter of circular aperture, inches,† dimension L.
E = entrainment ratio of jet.*
i = square root of -1*.
J_p = Bessel function of order p.*
o = subscript for source.*
p = exponent in series expansion.*
r = distance from axis of circular jet, inches,† dimension L.
t = auxiliary variable.*
W = time-mean velocity in z-direction, feet per minute,† dimensions L/T.
x = auxiliary variable.*
x = Cartesian coordinate in plane of jet source, inches,† dimension L.
y = Cartesian coordinate in plane of jet source, inches,† dimension L.
z = Cartesian coordinate in plane of jet source, inches,† dimension L.
ω = parameter in Bessel-function formula.*
ρ = fluid density, assumed constant, dimensions FT^2/L^4.

†Or other consistent units.
*Dimensionless.

Fig. 2 gives peak (or center) velocity ratios for jets from rounded rectangular sources of all aspect ratios. The term *velocity ratio* is reserved in this paper exclusively to express the ratio of the local time-mean velocity in the axial direction to the original peak velocity of the jet source.

Fig. 3 presents entrainment ratios for jets from rounded rectangular sources. This entrainment ratio is a measure of the amount of fluid circulating in the axial direction within the jet. It is defined as the ratio of the volumetric flow of the jet across a plane some distance z from the source to the volumetric flow emitted by the source. (A fluid of constant density is assumed.)

These first three figures purport to describe in detail the characteristics of fluid jets over extended ranges of dimension and velocity. The correlation on which they are based, however, has its limitations. These limitations will now be outlined, as the author presently understands them.

Nature of Jet: The charts are for *free* jets of *any constant-density fluid* discharging in one direction into a stationary field of the *same fluid.* The density and viscosity of the fluid affect the correlation only if the Reynolds number condition given is not satisfactorily met.

Nature of Jet Surroundings: Obviously, no jet is *free* in the sense of having characteristics which are completely independent of its surroundings. The data of Nottage[4] and of McElroy[5] appear to indicate that a jet may be considered as free until the cross-sectional area of the jet equals about one-fifth of the total cross-sectional flow-area of the region through which it is proceeding. For those cases where the source area itself is small compared with the region area A, the foregoing limitation is that the jet may be considered free so long as

$$z \leq 1.5\sqrt{A} \qquad (3)$$

Source Reynolds Number: Becher[6] reports that a jet ceases to be laminar when the source Reynolds number (based on the hydraulic diameter of the jet outlet) reaches about two thousand. The present correlation, however, is based on *fully developed turbulence.* Because of contradictory evidence for source Reynolds numbers less than 20,000, is seems best to choose this value as the lower

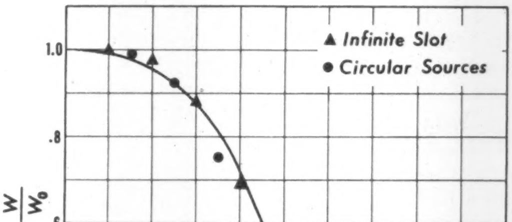

Fig. 4—Comparison of theory and experiment for velocity distributions near rounded circular sources

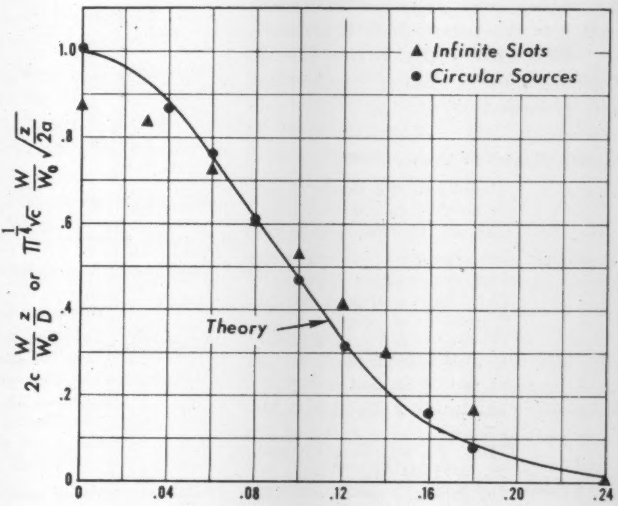

Fig. 5—Comparison of theory and experiment for velocity distribution at a distance from rounded infinite slots and rounded circular sources

limit of applicability of the computation charts. For Reynolds numbers lower than 20,000, the charts may predict velocities which are too high.

Jet Velocities: The source velocity must be low enough to prevent cavitation or compressibility effects. If a Mach number of 0.35 be set as the upper limit of *incompressible* flow, then air velocities under standard atmospheric conditions should be less than 20,000 fpm. Also, the accuracy of low velocity predictions can be upset by convection currents. Thus air-velocity predictions of less than 75 fpm must be considered as unreliable.

Use of the Computation Charts

The use of the charts will now be illustrated by specific numerical examples. Two salient jet features, the center velocity and the entrainment, can be readily computed by the use of Figs. 2 and 3. For velocities other than those on the jet axis, only order-of-magnitude results can be obtained from Fig. 1. Frequently, such precision is all that may be needed. In general, if higher precision is desired, recourse must be had to formulas. Suitable formulas will be given in this section. For simpler expressions which are valid for restricted zones of a jet, the reader may refer to the next section of this paper, or to Reference 7, which covers the Error Curve Zone for a wider class of jets than is here discussed.

Infinite, Rounded-Entrance Slots

Given: A rounded, slot source, 1 in. $\leq x \leq$ 1 in. ($a = 1$ in.) with $W_o = 3000$ fpm.

Required: (a) The peak velocity 4 ft from the source.
(b) The entrainment ratio 4 ft from the source.
(c) The velocity at a point P with coordinates $z = 48$ in., $x = 5$ in. and $y = 5$ in.

Solution: (a) In Fig. 2 use $z/2a = 24$, $z/2b = 0$.
Then $W_c/W_o = 0.53$ and $W_c = 1590$ fpm.
(b) In Fig. 3 use $z/2a = 24$, $z/2b = 0$.
Then $E = 2.65$
(c) From Fig. 1 can be obtained a rough estimate of the velocity at P.
Thus with $z/2a = 24$ and $x/2a = 2.5$, we read $W/W_o = 0.25$.

Therefore, $W = 750$ fpm. For a more accurate estimate, use Equation 2, remembering that

$$\operatorname{erf}(x) = -\operatorname{erf}(-x)$$

For the present problem:

$$\frac{x+a}{cz} = \frac{5+1}{0.0805 \times 48} = 1.552; \quad \frac{x-a}{cz} = \frac{5-1}{0.0805 \times 48} = 1.035$$

$$\frac{W}{W_o} = \sqrt{\frac{(0.97183-0.85673)}{2} \cdot \frac{(1+1)}{2}} = 0.239$$

Rectangular, Rounded Entrance Apertures

Given: A rounded, rectangular source $W_o = 3000$ fpm; $-1 \leqq x \leqq +1$ in. ($a = 1$ in.); -3 in. $\leqq y \leqq +3$ in. ($b = 3$ in.)

Required: Same information as before.

Solution: (a) In Fig. 2 use $z/2a = 24$, $z/2b = 8$
Then $W_c/W_o = 0.46$ and $W_c = 1380$ fpm.
(b) In Fig. 3 use $z/2a = 24$, $z/2b = 8$
Then $E = 4.32$
(c) This estimate is best accomplished with the aid of the following generalization of Equation 2:

$$\frac{W}{W_o} = \sqrt{\left\{\frac{\operatorname{erf}\frac{x+a}{cz} - \operatorname{erf}\frac{x-a}{cz}}{2}\right\}\left\{\frac{\operatorname{erf}\frac{y+b}{cz} - \operatorname{erf}\frac{y-b}{cz}}{2}\right\}} \text{ ---------- } (4)$$

Since:

$$\frac{x+a}{cz} = 1.552; \quad \frac{x-a}{cz} = 1.035$$

$$\frac{y+b}{cz} = 2.070; \quad \frac{y-b}{cz} = 0.517$$

$$\frac{W}{W_o} = \sqrt{\left\{\frac{0.97183-0.85673}{2}\right\}\left\{\frac{0.99658-0.53531}{2}\right\}} = 0.115$$

Therefore, $W = 346$ fpm

Circular, Rounded-Entrance Orifices

Given: A rounded-entrance, circular source. $W_o = 3000$ fpm. Inside diameter: 0.9 in.

Required: (a) The peak velocity 9 in. from the source.
(b) The entrainment ratio 9 in. from the source.
(c) The velocity 9 in. from the plane of the source, and 1.08 in. off the jet axis.

Solution: As an adequate short-cut, circular jets are approximated by square jets of equal area, and radial velocity profiles are mimicked by the corresponding profiles along a principal axis of the square.
(a) $(2a)^2 = (\pi/4)D^2$ Therefore, $2a = 0.795$ in. $z/2a = 11.3$; $z/2b = 11.3$
From Fig. 2 $W/W_o = 0.565$; $W = 1700$ fpm
(b) From Fig. 3 with $z/2a = 11.3$,
$z/2b = 11.3$, $E = 3.45$
(c) For the off-axis velocity:

$$\frac{W}{W_o} = \sqrt{\left\{\frac{\operatorname{erf}\frac{r+a}{cz} - \operatorname{erf}\frac{r-a}{cz}}{2}\right\}\operatorname{erf}\frac{a}{cz}} \text{ --- } (5)$$

$$= \sqrt{\left\{\frac{0.99607-0.81720}{2}\right\}\left\{0.96497\right\}} = 0.294$$

$$W = 782 \text{ fpm}$$

Sharp-Edged Apertures

Figs. 1, 2 and 3 pertain to jet sources with rounded nozzle contours. With such sources the peak source velocity, W_O, persists over most of the source cross-section, and the contraction coefficient and discharge coefficient are close to unity (the value assumed for the charts.) With other sources, having edges of varying degrees of sharpness, the contraction coefficient (and also the discharge coefficient) ranges from the minimum of 0.61 upwards toward 1.00.[6,8] To account for this type of deviation from ideal conditions, the empirical correction method used by others is adopted and each dimension of the original source is multiplied by the factor

$$\sqrt{C_d}\ .$$

The effective propagation area of the source is thus equated to its effective flow area. In Figs. 1, 2 and 3, therefore, a and b are replaced by a' and b' determined as follows:

$$a' = \sqrt{C_d}\,a; \quad b' = \sqrt{C_d}\,b.$$

Comparisons of Theory and Experiment

Some of the analytical solutions of Equation 1 will be considered to determine how they agree with experiment. All comparisons will be made using the single value of $c = 0.0805$.

Infinite, Rounded-Entrance Slots

In this case the problem is two-dimensional, since the flow characteristics must be independent of y. Equation 1 reduces to:

$$\frac{\partial \rho W^2}{\partial (z^2)} = \frac{c^2}{4} \cdot \frac{\partial^2 \rho W^2}{\partial x^2} \text{ ---------------- (6)}$$

The methods of Reference 9, Chapter II, readily yield for this case:

$$\frac{W}{W_0} = \sqrt{\left\{\frac{\operatorname{erf}\frac{a+x}{cz} - \operatorname{erf}\frac{x-a}{cz}}{2}\right\}} \text{ -----(7)}$$

When $a/cz >> 1$, this formula reduces to the following:

$$\frac{W}{W_0} = \sqrt{\frac{1 - \operatorname{erf}\frac{x-a}{cz}}{2}} \text{ --------------(8)}$$

Thus W/W_0 becomes a function of the single variable $(x-a)/z$ in the *near* field. Fig. 4 compares this result with the long-slot experiments of Albertson et al.[10]

When $a/cz << 1$, the formula becomes:

$$\frac{W}{W_0} = \sqrt{\frac{2a}{cz\sqrt{\pi}}} \exp\left(\frac{-x^2}{2c^2z^2}\right) \text{ --------(9)}$$

giving the Gaussian Error profile, with an attenuation proportional to the inverse square root of distance from the source. Fig. 5 shows how Equation 9 agrees with measurements in the *far* field, as reported by Reference 10.

Along the jet center-plane, Equation 7 becomes:

$$\frac{W}{W_0} = \sqrt{\operatorname{erf}\frac{a}{cz}} \text{ ------------------(10)}$$

This is a simple and continuous expression for the peak velocity, which is valid from the plane of the source ($z = 0$) out to infinity. Fig. 6 compares this analytical result with the data of Reference 10.

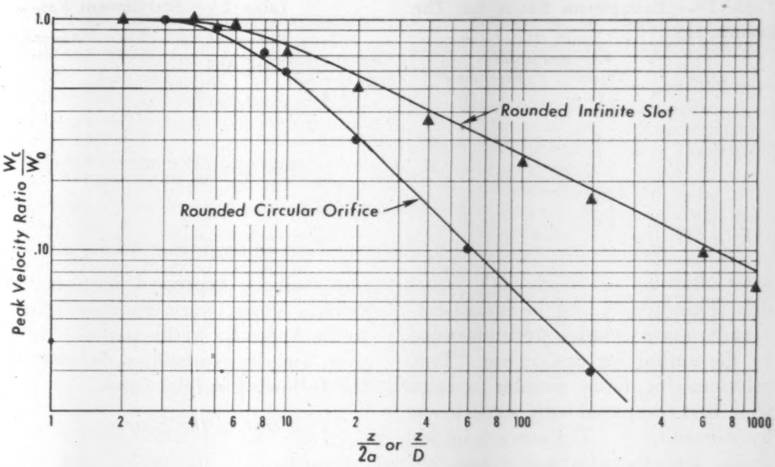

Fig. 6—Comparison of theory (solid line) and experiment for center, or peak, velocities from rounded infinite slots and rounded circular sources

Entrainment ratios for the infinite slot can be found by integration of Equation 7. The results of such integration are incorporated in Fig. 3. In Table 1 they are compared with the findings of Albertson et al.

Discrepancies between theory and experiment only become important at some distance from the source, where better agreement would be achieved with a value of $c = 0.1$. Moreover, these discrepancies seem less serious when differences between observers are examined. Equation 11 due to Becher, for example, indicates $c = 0.087$.

Rectangular Apertures (Rounded and Sharp-Edged)

The general theory of Reference 9, Chapter I, shows that the solution for a rectangular source of dimensions $a \times b$ can be regarded as the product of the solution for an infinite slot of width $2a$ and the solution for an infinite slot of width $2b$. Thus Equation 4 is obtained from Equation 2. This theoretical conclusion is strikingly confirmed by the following empirical equations of Becher, which are applicable in the *far* field.

Infinite Slots (rounded)

$$\frac{W_c}{W_0} = 2.55\sqrt{\frac{2a}{z}} \text{ ------------------ (11)}$$

Rectangular Apertures (rounded)

$$\frac{W_c}{W_0} = 6.50\left\{1 + 0.13\left(\frac{a}{b}\right)^2\right\}\frac{\sqrt{(2a)(2b)}}{z} \text{ -(12)}$$

Except for the term $0.13(a/b)^2$, which is of no importance when $a/b < 1/2$, and not of much importance in any event, the prediction is precisely confirmed.

An expression for the velocity along the axis of a rectangular source is obtained directly from Equation 4. Thus:

$$\frac{W_c}{W_0} = \sqrt{\operatorname{erf}\frac{a}{cz} \cdot \operatorname{erf}\frac{b}{cz}} \text{ ---------(13)}$$

This formula is compared with the experiments of Becher in Fig. 7. The solutions exhibit first the constant *core* velocity, then the inverse square root behavior, and finally, the characteristic reciprocal attenuation of the *far* field. The *transition* points appear at nearly the right distances from the sources.

Entrainment ratios for sharp-edged, rectangular sources were obtained by Tuve, Priester and Wright.[11] Table 2 compares these data with values obtained by integration of Equation 4, and embodied in Fig. 3. A constant discharge coefficient of 0.725 was used in the calculations in accordance with the method outlined in the preceding section on Use of Computation Charts. The agreement between theory and experiment is probably within the experimental error.

Circular Orifices (rounded)

In a discussion of circular jets, distinction must be made between

Table 1 — Entrainment Ratios For The Infinite Slot

$z/2a$	Entrainment Ratios	
	Theory	Experiment[10]
1	1.08	1.08
2	1.15	1.16
3	1.24	1.24
4	1.32	1.32
5	1.40	1.40
10	1.78	1.98
20	2.46	2.77
40	3.40	3.92
80	4.78	5.54
110	5.60	6.50

Table 2 — Entrainment Ratios For Sharp-Edged Rectangular Sources

Outlet Dimensions In.	Aspect Ratio	Entrainment Ratio At 9 Ft. From Source[a] Theory	Experiment[11]
Fixed Area			
8.48 x 8.48	1.0	4.50	4.36
10.3 x 7	1.47	4.50	4.93
12 x 6	2.0	4.55	4.25
14.4 x 5	2.9	4.60	4.71
18 x 4	4.5	4.70	4.30
24 x 3	8.0	5.00	4.81
Fixed Length			
24 x 3	8.0	5.00	4.81
24 x 2	12.0	5.95	6.61
24 x 1	24.0	8.52	8.12
24 x ½	48.0	12.05	11.43

[a] The source velocity for these data was approximately 1100 fpm.

true solutions of Reichardt's equation (Equation 1) and the equivalent-square approximation recommended by the author for design use. True solutions for finite circular sources were first compared with experiment by Alexander.[2] The success of his work, and its practical value, encouraged the present writer to undertake extensions to non-circular outlets. Although the contents of the next few paragraphs add nothing fundamental beyond what Alexander has already established, they do add certain new theoretical results and further experimental confirmation.

The analytical solution for a circular jet can be written directly from Reference 9, p. 220. Thus:

$$\left(\frac{W}{W_0}\right)^2=\frac{2}{c^2z^2}\exp\left(\frac{-r^2}{c^2z^2}\right)\int_0^{\frac{D}{2}}\exp\left(\frac{-r'^2}{c^2z^2}\right)J_0\left(\frac{i2rr'}{c^2z^2}\right)r'dr' \text{ ------------------------- (14)}$$

In general, the indicated integral cannot be evaluated in closed form, but must be expressed in terms of infinite series, such as those given in the Appendix of this paper. However, simple expressions do exist in the following special cases.

(a). *Close to the Source*:

$$\left(\frac{W}{W_0}\right)^2=\frac{1}{2}\left\{\operatorname{erf}\frac{r}{cz}-\operatorname{erf}\frac{r-\frac{D}{2}}{cz}\right\}-\frac{1}{\sqrt{8\pi}}\,\frac{cz}{r}\,\exp\left(\frac{-r}{cz}\right)\left\{\exp\left(\frac{D}{2cz}\right)-1\right\} \text{ -------- (15)}$$

This equation has a maximum error less than 0.28 cz/r as long as the absolute value of $(1-D/2r)$ is not greater than one.

(b). *Far from the Source*:

$$\frac{W}{W_0}=\frac{D}{2cz}\exp\left(\frac{-r^2}{2c^2z^2}\right) \text{ ----------- (16)}$$

This equation constituted the original basis for the Reichardt equation.

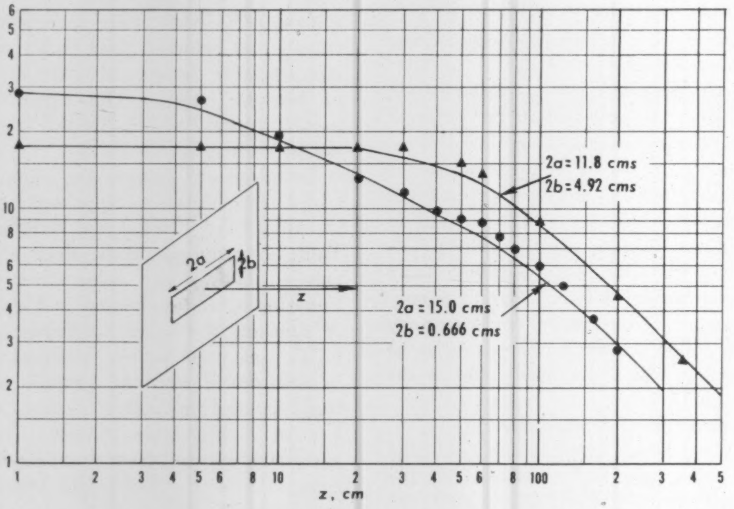

Fig. 7—Comparison of theory (solid line) and experiment for center, or peak, velocities from rounded, rectangular jet sources
(*Note:* 1m/sec = 200 fpm; 10 cms = 4 in.)

(c). *On the Jet Axis*:

$$\left(\frac{W}{W_0}\right)^2=1-\exp\left(\frac{-D^2}{4c^2z^2}\right) \text{ ------------ (17)}$$

This expression is exact. It was given by Alexander.

(d). *On the Cylinder containing the Source* $(r = D/2)$:

$$\left(\frac{W}{W_0}\right)^2=\frac{1}{2}\left\{1-\exp\left(\frac{-D^2}{2c^2z^2}\right)\right\}J_0\left(\frac{iD^2}{2c^2z^2}\right) \text{ 18)}$$

This expression is exact. It is a new result.

Comparing first Equation 15 with Equation 8, it is noted that the velocity patterns of both the circular jet and the infinite slot should be similar near the source. This conclusion is substantiated by the experimental data of Albertson et al,[10] as shown in Fig. 4. However, the original, unaveraged data for the circular source show that a trend with z begins sooner in this case, than in the case of the infinite slot. On the cylinder $r = D/2$, Equation 18 reproduces this trend quantitatively.

Fig. 5 shows the expected good agreement of Equation 16 with experiment.

Table 3 — Entrainment Ratios For Circular Jets

x/D	Entrainment Ratios	
	Theory[a]	Experiment[10]
1	1.18	1.14
2	1.38	1.32
3	1.60	1.56
5	2.09	2.17
10	3.42	3.20
20	6.6	6.4
40	13.0	12.8
80	25.3	25.6
93	29.0	29.8

[a] As represented by the equivalent-square approximation.

To validate the equivalent-square approximation, center velocities were computed with the aid of Fig. 2, and compared with experimental results in Fig. 6.

Finally, equivalent-square entrainment ratios are compared with the findings of Albertson et al in Table 3. The agreement is all that might be desired.

Conclusions

1. With varying degrees of success, but with an accuracy sufficient for almost all engineering purposes, the free-turbulence equation of Reichardt correlates the performance of free jets. A value of 0.0805 for the constant c in Equation 1 provides satisfactory agreement with experiment.

2. A rectangular source of dimensions $a \times b$ behaves like the product of two infinite slot sources, one of width $2a$, the other of width $2b$. As a result, easily-used nomograms for peak velocity and entrainment ratio (Figs. 2 and 3) can be constructed. These nomograms are valid for sources of all aspect ratios.

3. The peak velocities and entrainment ratios of a circular jet are well approximated by those for a square jet of equal source area. Thus Figs. 2 and 3 may be employed for circular jets.

Acknowledgment

The author gratefully acknowledges financial assistance from the Case Institute of Technology Research Fund. He is indebted to Prof. G. L. Tuve for many informative discussions. The nomograms were computed and constructed by Dale Hill of the Case Statistics Laboratory, and the figures were prepared by Mrs. Ruth Strahosky.

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APPENDIX

Series Expansions for the Velocity from a Circular Source

The integration in Equation 14 can be made by parts with the aid of the following well-known recurrence formula for the Bessel functions:

$$x^p J_{p-1}(\omega x) = \frac{1}{\omega} \cdot \frac{d}{dx} \left\{ x^p J_p(\omega x) \right\} \text{------} (19)$$

Since $J_p\ (0) = 0$ for all $p \geqslant 1$, the following series expansion is obtained:

$$\left(\frac{W}{W_0}\right)^2 = \exp \left\{ \frac{-r^2}{c^2 z^2} \left(1 + \frac{D^2}{4r^2}\right) \right\} \sum_{p=1}^{\infty} \left(\frac{D}{2r}\right)^p J_p\left(\frac{irD}{c^2 z^2}\right) \text{--------} (20)$$

Another expansion, suitable for small r, can be found by means of the generating function for the Bessel functions. Thus:

$$\exp \left\{ \frac{x}{2}\left(t - \frac{1}{t}\right) \right\} = \sum_{p=-\infty}^{+\infty} J_p(x) t^p = \sum_{p=0}^{\infty} J_p(x) t^p + \sum_{p=1}^{\infty} J_{-p}(x) t^{-p} \text{--------} (21)$$

Since, for integral values of p:

$$J_{-p}(x) = (-1)^p \cdot J_p(x) \text{--------} (22)$$

then:

$$\sum_{p=1}^{\infty} J_p(x) t^p = \exp \left\{ \frac{x}{2}\left(t - \frac{1}{t}\right) \right. - \sum_{p=1}^{\infty} (-1)^p \cdot J_p(x) t^{-p} - J_0(x) \text{--------} (23)$$

When Equation 23 is used in Equation 20, a second series is found.

$$\left(\frac{W}{W_0}\right)^2 = 1 - \exp \left\{ -\frac{r^2}{c^2 z^2} \left(1 + \frac{D^2}{4r^2}\right) \right\} \sum_{p=0}^{\infty} \left(\frac{2r}{D}\right)^p \cdot \frac{J_p\left(\frac{irD}{c^2 z^2}\right)}{(i)^p} \text{--------} (24)$$

Finally, adding together one-half of each of the above two series, a third expansion, useful near $r = D/2$, is obtained:

$$\left(\frac{W}{W_0}\right)^2 = \frac{1}{2} - \frac{1}{2} \exp \left\{ -\frac{r^2}{c^2 z^2} \left(1 + \frac{D^2}{4r^2}\right) \right\} \left[J_0\left(\frac{irD}{c^2 z^2}\right) + \sum_{p=1}^{\infty} \left\{ \left(\frac{D}{2r}\right)^p - \left(\frac{2r}{D}\right)^p \right\} \frac{J_p\left(\frac{irD}{c^2 z^2}\right)}{i^p} \right] \text{---} (25)$$

When $r = D/2$, this expression reduces to Equation 18.

JOURNAL SECTION

Result of Panel System Research is Better Design

Panel heating, a precocious youngster from the start, soon became a public idol. With too much attention, it grew so fast that art outstripped science. Empirical values far surpassed technical knowledge and development. The day came when Engineering found itself incapable of effectively explaining discrepancies in performance.

The ASHVE, keenly aware of its responsibility for contributing to a better understanding of these systems, thrust its research program into high gear. The Technical Advisory Committee for this program subdivided its interest into four working groups. They inaugurated extensive investigations under simulated and actual conditions.

GROUP A studied performance within the panel, behind the active surface, to analyze heat flow patterns within a concrete slab. Five technical papers, three of them written in 1950, one in 1951, and one in 1953, detail results of this research in heat flow. Subsequently, attention was given to plaster panels. This research is reported in two technical papers on thermal characteristics of plaster panels. One revealed preliminary steps taken in 1951. The other, written in 1953, listed conclusions reached.

GROUP B studied performance on the room side of the panel, or heat transfer within the occupied room. The group's task included design of a calorimeter room, now known as the Environment Laboratory. Although this facility accounted for a large sum, $76,500, it has proved a most useful tool for heating and cooling research. Here, since early 1952, heat transfer from both floor and ceiling panels has been checked in a series of exhaustive tests. These were conducted under uniform and non-uniform conditions. Research on rooms without furniture was covered in two technical papers, presented by Laboratory staff members in 1953, on heat exchanges in ceiling and in floor panel-heated rooms. Supplementary research of this group on effects of furniture, floor coverings, and lighting on panel systems was presented in a technical paper, read at the Society's 60th Annual Meeting in 1954. As in the first tests, exchange rates were measured, variables investigated, and infiltration air rates and temperatures checked under both uniform and non-uniform conditions.

GROUP C was to study relationship between radiation and comfort, but its interests were transferred to the TAC on Sensations of Comfort when duplications appeared in their planned research.

GROUP D tested relationship of controls to panel systems. Its work was augmented by establishment of a Research Fellowship, under direction of Prof. A. B. Algren, at the University of Minnesota. During the rather severe winters of Minnesota in 1951-53, field studies were made in Milwaukee and Minneapolis for data on relationship of controls to panel systems. Two papers, one in 1953, the other in 1954, on the effects of controls during trying heating periods, concluded GROUP D's program for floor panels.

Present plans for continuation of panel research include studies for GROUP B, only. No further work is now contemplated for GROUPS A and D; however, the latter is on an inactive status, and available if problems are encountered in panel cooling studies.

Testing effects of heating only sections of walls, floors, or ceilings; effects of changing size or shape of rooms; and methods to separate radiative and convective components of total heat transfer comprise planned panel system research, as well as research on ceiling panels operated for cooling purposes.

P. B. Gordon, chairman of the Technical Advisory Committee for Panel Heating and Cooling, announced, recently, the appointment of a subcommittee to guide coordination of data already accumulated into a procedure for improved design. Concrete panel research has already developed more accurate data for THE GUIDE 1954. Plaster panel studies provide a suitable foundation for prediction of "good," "poor," and "best" in panel performance. Information, to date, on heat exchanges within the room is setting the pattern for future design. Characteristics, now known, of both floor and ceiling panels make reasonable output calculation possible.

Foreseeable results of future research, in cooperation with the TAC on Sensations of Comfort, include revising the ASHVE Comfort Chart with data on the influence of radiation.

JOURNAL SECTION

A Two-Sphere Radiometer

By D. J. Sutton* and P. E. McNall, Jr.,** Minneapolis, Minn.

SUMMARY — This paper presents the theory and some of the design details of a nondirectional radiometer which can be used to measure the effective mean radiant temperature in an environment having low temperature (below about 250 F) surfaces. The present instrument gives a reading which is independent of air temperature and air velocity effects, and measures the average mean radiant temperature over a five-minute interval.

THE RESULTS of many investigations indicate that radiation accounts for almost half of the heat loss from a sedentary individual.[1] Since this is apparently true, radiation effects have received increasing attention in recent years, especially with the advent of panel heating and the large picture window type of construction.

The environmental mean radiant temperature, which is the main environmental factor influencing the human body's radiation heat loss, might be defined as that uniform surface temperature, of a black-body enclosure, which will result in the same net radiation heat loss, or gain, from the body under consideration as occurs in the actual environment being investigated. As yet, methods of measuring this factor are inconvenient to use. Lack of progress in developing better mean radiant temperature measuring devices is understandable when it is realized that the Mean Radiant Temperature (MRT) of a non-uniform environment will vary from point to point within that environment, and also will be different for objects of different shapes located at the same point. The difficulty of obtaining a sensing element capable of assuming the many shapes and positions of the human body is at once realized, and although several cylindrical radiation sensitive devices have been used to simulate the human body more accurately, [2,3,4,5] a spherical sensing element such as the globe thermometer is probably the only satisfactory instrument used at the present time to measure nondirectional MRT. The term nondirectional implies that the radiation influence on the element is equal in all directions.

The Globe Thermometer: Globe thermometers [6,7,8] are usually 6-in. or 8-in. diameter blackened spheres. Such a sphere is located at the point where the MRT measurement is desired, and the sphere equilibrium temperature is recorded along with the ambient air temperature and air velocity near the globe. These factors can then be substituted into an equation which, when solved, yields the nondirectional MRT. MRT determinations with the globe thermometer, therefore, require simultaneous measurement of three variables and solution of an equation. The equation has been made available in the form of an alignment chart, but nevertheless, the measurement procedure is not as simple as might be desired. An instrument capable of measuring nondirectional MRT independently of air temperature and air velocity effects would be an improvement over the existing method. The instrument described in this paper was designed as an attempt at such an improvement.

A New Nondirectional Radiometer*

The proposed two-sphere radiometer is simple and makes use of two geometrically identical spherical elements (Fig. 1). One sphere is gold plated and polished to minimize its radiation exchange by virtue of a low surface emissivity, while the other has a blackened, high-emissivity surface to maximize its radiation exchange. The two spheres are electrically heated to some temperature which is usually above both the ambient air temperature and MRT, and are then controlled at that predetermined temperature. Since the spheres are geometrically identical, operate at the same temperature, and are located in essentially the same en-

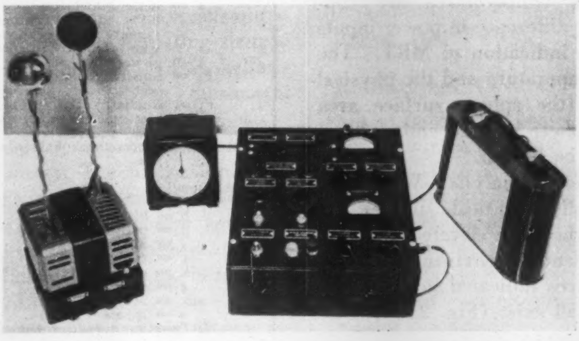

Fig. 1—Two-sphere radiometer and its associated equipment

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[1] Exponent numerals refer to Bibliography.

Presented at the 60th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Houston, Tex., January 1954.

*After a good share of the development work on this instrument was completed an article describing a radiometer based on a similar operating principle came to the authors' attention.[9]

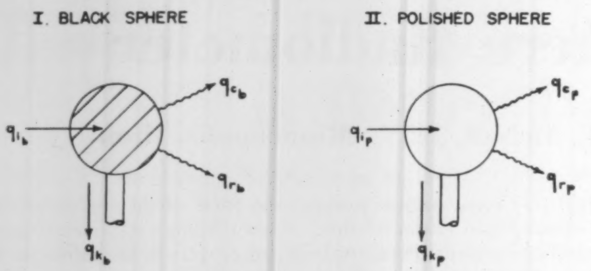

Fig. 2—Sphere heat balances

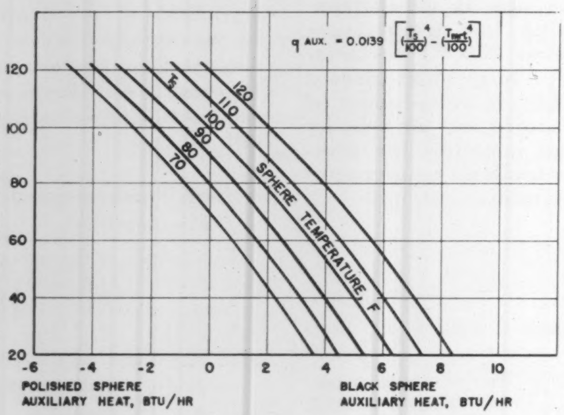

Fig. 3—Mean radiant temperature *vs.* auxiliary heat input for various sphere temperatures

vironment, the conduction and convection losses are the same for both, and the difference in heat inputs required to maintain the spheres at the same temperature is equal to the difference in radiation heat losses. Knowing this difference and the sphere operating temperature, the effective non-directional mean radiant temperature (MRT) of the surrounding environment can be obtained from a graph or by calculation. When the sphere temperatures are controlled, the difference in power inputs is a direct indication of MRT. The control temperature and the physical constants (the sphere surface area and the sphere surface emissivities) must also be known.

Theoretical Analysis: When two geometrically identical spheres are heated to the same elevated temperature in identical environments, the heat balances indicated in Equations 1 and 2 will exist (Fig. 2).

$$q_{ib} = q_{cb} + q_{kb} + q_{rb} \;\ldots\ldots (1)$$

$$q_{ip} = q_{cp} + q_{kp} + q_{rp} \;\ldots\ldots (2)$$

Since the spheres are geometrically identical, operate at the same temperature and are in the same environment, the conduction and convection losses must be the same for both.

$$q_{cb} + q_{kb} = q_{cp} + q_{kp} \;\ldots\ldots\ldots (3)$$

Nomenclature

q = heat flow, Btu per hour.
σ = Stefan-Boltzmann constant, 0.173×10^{-8}, Btu per (hour) (square foot) (Fahrenheit degree absolute to the fourth power).
F_e = emissivity factor for radiation heat transfer, dimensionless.
F_A = angularity factor for radiation heat transfer, dimensionless.
A = area, square feet.
T = temperature, Fahrenheit absolute.

Subscripts

b = black sphere
p = polished sphere
i = input
c = convection
k = conduction
r = radiation
aux = auxiliary
s = sphere
MRT = mean radiant temperature

Subtracting Equation 2 from Equation 1 and simplifying,

$$q_{ib} - q_{ip} = q_{rb} - q_{rp} \;\ldots\ldots\ldots (4)$$

The Stefan-Boltzmann equation for computing net radiation heat exchange between two surfaces at temperatures T_1 and T_2 is [10]

$$q_r = \sigma\, F_e\, F_A A\, [T_1^4 - T_2^4] \;\ldots. (5)$$

For the special case where a small sphere radiates heat to a large enclosure with an equivalent black-body surface temperature (T_{MRT}), the emissivity factor F_e can be assumed to equal the sphere surface emissivity, and the angularity factor F_A can be taken as unity. [10] When this is the case, the equations for the sphere net radiation heat losses are as follows:

$$q_{rb} = \sigma\, F_{eb}\, F_{Ab}\, A_b\, [T_b^4 - T_{MRT}^4] \;..(6)$$

$$q_{rp} = \sigma\, F_{ep}\, F_{Ap}\, A_p\, [T_p^4 - T_{MRT}^4] \;..(7)$$

Since $F_{Ab} = F_{Ap} = 1$, $A_b = A_p = A_s$, and $T_b = T_p = T_s$, subtracting Equation 7 from Equation 6 and substituting into Equation 4 gives

$$q_{ib} - q_{ip} = \sigma\, A_s\, (F_{eb} - F_{ep})\, [T_s^4 - T_{MRT}^4] \;\ldots\ldots\ldots\ldots (8)$$

The quantity $(q_{ib} - q_{ip})$ is the difference in heat inputs to the two spheres and is hereafter referred to as auxiliary heat input with the designation q_{aux}. Therefore,

$$q_{aux} = \sigma\, A_s\, (F_{eb} - F_{ep})\, [T_s^4 - T_{MRT}^4] \;\ldots\ldots\ldots\ldots (9)$$

Fig. 3 is a plot of Equation 9 for a two-sphere radiometer utilizing 2-in. diameter spheres with surface emissivities of $F_{eb} = 0.94$ and $F_{ep} = 0.02$. Inspection of this figure indicates that when the sphere temperatures are controlled at some known constant value, the difference in power inputs (auxiliary heat) is a direct indication of the MRT.

Description of the Existing Radiometer

The first experimental radiometer model based on this operating principle is shown in Fig. 1, along with its control box, cycle timer, and auxiliary input battery. This model

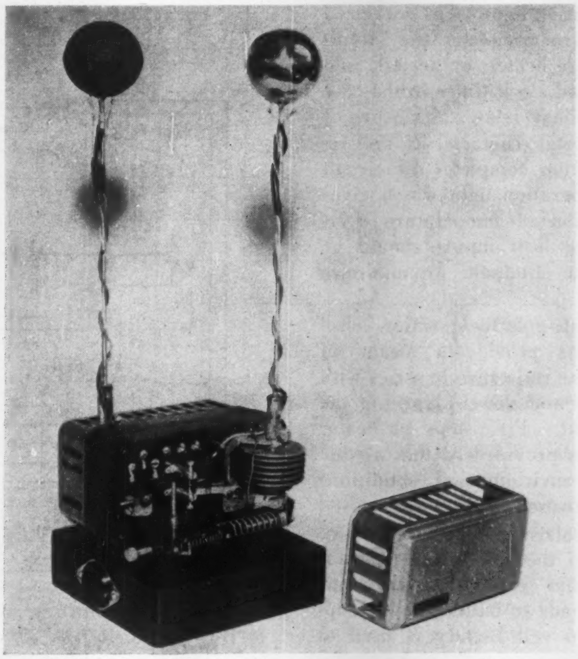

Fig. 4—Radiometer with thermostat cover removed

utilizes on-off temperature control of the sphere elements, and the average MRT is measured during a five minute interval. Two bellows type thermostats were modified so that the limit switch contacts provided small differential on-off temperature controls (Fig. 4).

The two 2-in. diameter spherical elements are actually thin copper shells (0.008-in. wall thickness). Each sphere contains two small manganin resistance heaters and an iron-constantan thermocouple. These elements are mounted on four small hermetic seal units. The heaters are designated as primary and auxiliary heaters. The primary heaters are connected in parallel so that the primary inputs are the same to both spheres. The primary heat input is ordinarily controlled by the polished sphere thermostat so as to maintain that sphere at the desired control temperature. The primary input is usually not sufficient to bring the black sphere up to the control temperature, so some additional heat input is required. This additional input to the black sphere is controlled by the black sphere thermostat and is designated as auxiliary heat. The auxiliary heat brings the black sphere temperature up to the desired level and is a measure of the difference in radiation heat losses which can be related to MRT.

Using two heaters in this manner makes it possible to measure auxiliary input directly rather than by making two independent power input measurements and subtracting to obtain the difference. The auxiliary heater in the polished sphere would be used if the MRT were ever greater than the control temperature. When this is the case, the primary heat input is controlled by the black sphere thermostat, and the polished sphere thermostat controls auxiliary heat input to the polished sphere. A primary heat selector switch on the control box makes it possible to reverse the control action. The iron-constantan thermocouples are located at the geometric centers of the spheres. These couples are used whenever it is desirable to adjust or check the control temperatures. Four binding posts on the base of the radiometer facilitate lead-wire connections to the temperature measuring instrument.

After final assembly the spheres and the thermostat control bellows were evacuated and charged with ethyl chloride. The quantity of fill is just sufficient to immerse the heating elements which extend approximately ¼ in. above the bottom of the sphere. The fill has three functions in the present radiometer model.

1. *The Control Function*: The liquid-vapor interface in the sphere senses sphere temperature, and the saturation pressure corresponding to this temperature is transmitted through the sphere mounting stem to the control bellows. The bellows movement actuates the thermostat contact linkage shown in Fig. 4.

2. *Prevention of Excessive Heater Temperatures*: The fill immerses the sphere heating elements and thereby prevents excessive heater temperatures by providing a high heat transfer coefficient between the heater and the liquid.

3. *Uniformity of Surface Temperature*: The third function of the volatile fill is to provide uniformity of sphere surface temperature. The fill is continuously being evaporated from the liquid surface and condensing on the inside of the vapor-exposed shell. This results in a uniform surface temperature with a relatively low heat capacity sphere. A low mass element is easier to control and has faster response to environmental changes than would be possible with a more massive element such as a solid copper sphere.

The spheres were mounted at a sufficient height above the radiometer base and at a sufficient distance from each other to reduce the effects of radiation interception to a negligible magnitude.

Radiometer Control Circuit

The radiometer control circuit and heater wiring diagram is shown in Fig. 5. A 6.3 volt filament transformer was used as the control circuit power supply and also supplies the power for the primary heaters. Two double-pole double-throw relays were used. A closure of the thermostat contacts in one direction completes the circuit to a relay and a green operation light. The energized relay in turn completes the circuit to the sphere heater, or heaters, and to a standard clock timer in the case of the auxiliary relay. A closure of the thermostat contacts in the reverse direction completes the circuit to a red operation light which gives an indication of temperature overshoot. The heat inputs should be adjusted to eliminate or minimize overshoot.

Two single-pole five-position selector switches provide a means of changing the resistance in series with the heaters and thereby varying the power input. Five steps of heater power were provided so that a wide range of environmental conditions could be covered.

Two polarized sockets were mounted in the side of the control box so that external connections could be made to battery power supplies. A 6 volt battery is used to supply auxiliary power, and as mentioned previously, the primary power is at present supplied from the control circuit transformer. A means of supplying battery power to the primary heaters was also provided. Two meters indicate d-c input voltages, and series potentiometers are provided so that the input voltages can be adjusted to the desired values. The radiometer was calibrated on the basis of an auxiliary input voltage of 5.0v d-c as indicated on the auxiliary input voltmeter.

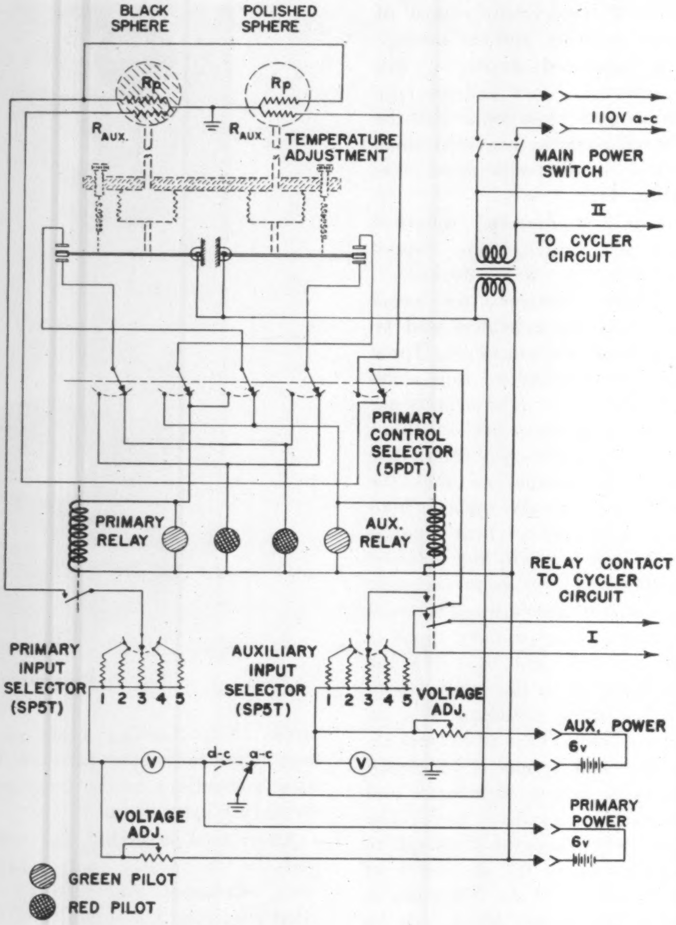

Fig. 5—Radiometer control circuit and heater wiring diagram. Lines I and II connect to corresponding lines in Fig. 6

The wiring diagram for the repeating cycler circuit is shown in Fig. 6. The circuit connections with the wiring of Fig. 5 are indicated. The cycler is housed in the control box and makes use of a synchronous motor-driven gear train and cam. The cam actuates a single-pole double-throw microswitch which acts in conjunction with a double-pole double-throw relay to provide a holding circuit. This holding circuit functions to produce a cycle of 5 min ± 1 sec duration every time the starter button is depressed. A white pilot bulb indicates that a cycle is in progress.

At the start of a cycle the microswitch cam follower is on the cam lobe and the switch is in position (a) as shown in Fig. 6. When the starter button is depressed the relay pulls in and remains energized through a holding circuit when the button is released. The holding circuit provides current to the cam motor and pilot bulb through the *in* relay contacts. The cam motor rotates the cam, and after approximately 54 sec the microswitch follower leaves the cam lobe and the microswitch movable contact goes to position (b). When this occurs the relay is de-energized and the circuit to the cam motor and pilot bulb is completed through the *out* relay contacts. When the microswitch is in position (b) power is supplied to the standard timer every time the auxiliary input relay is energized. The microswitch stays in this position for 5 min ± 1 sec. The cam motor continues to drive, and when the cam reaches its original starting position the entire circuit is de-energized. The circuit cannot be reactivated until the starter button is again depressed. The standard timer (Fig. 1) plugs into an outlet on the front of the control box and runs every time the auxiliary relay is energized during the 5 min portion of the cycle. At the end of the 5 min interval the *Total-On-Time* reading is an indication of the average auxiliary power input during the 5 min period.

Fig. 7 shows the calibration curve for the radiometer operating with on-off control at a 90 F temperature.

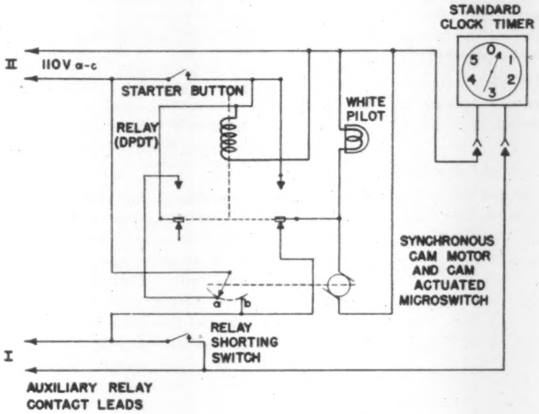

Fig. 6—Repeating cycler circuit. Lines I and II connect to corresponding lines in Fig. 5

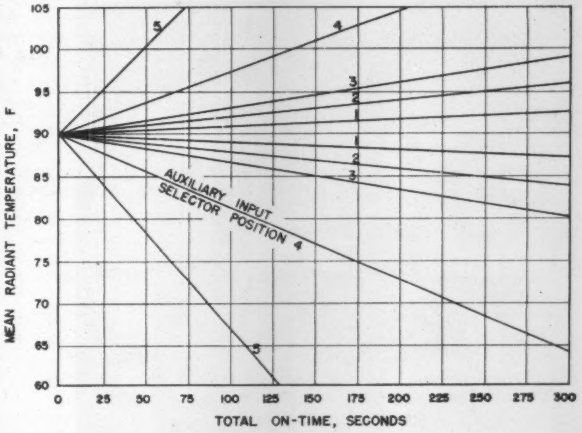

Fig. 7—Radiometer calibration curve for a 90 F control temperature

Mean Radiant Temperature is plotted against *Total-On-Time* for the five auxiliary input selector positions.

Radiometer Operation

To make an MRT measurement the operator adjusts the radiometer power inputs so that the sphere heaters cycle properly. Cycling is indicated by on-off operation of the green pilot bulbs on the control box. Having done this he depresses the cycler starter button. The on-cycle is indicated by a white pilot bulb. The operator is then free to perform other tasks during the measurement interval. After approximately 5 min have elapsed, the cycler automatically turns off and the *Total-On-Time* reading is retained on the timer. When the white pilot goes out, indicating completion of the cycle, the operator records the *Total-On-Time* reading and the auxiliary input selector position. Knowing these terms the MRT can be obtained from the calibration chart, Fig. 7. The auxiliary input selector position will usually not have to be changed in any one environment. After recording the data for a particular run, the radiometer can be moved to a new position for another MRT reading. A 12-ft connection cable makes it possible to move the radiometer over a large area without having to move the control box. To start the next measuring cycle the operator resets the timer to zero and depresses the starter button.

Field Experience with the Two-Sphere Radiometer

The radiometer has been used in several limited MRT surveys in homes and apartments in the Minneapolis area, and also was used to measure MRT in THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS' Environment Laboratory in Cleveland, Ohio. Readings obtained in the Minneapolis area were reasonable in all cases and reproducibility of data was good. Readings obtained in the Environmental Laboratory agreed closely with MRT values computed on the basis of globe thermometer data, being within ±0.4 F under two different sets of conditions. The MRT's in the Environment Laboratory were also computed on the basis of geometry and surface temperature measurements. The radiometer values and these computed values agreed within ± 1.5 F. Fig. 8 shows a typical radiometer test setup.

A critical error analysis indicated the importance of accurate temperature control. For this reason, a portable potentiometer has been used to make frequent checks of the sphere control temperatures. This minimizes control temperature errors such as those caused by variations of atmospheric pressure. It is believed that the MRT measurements have been accurate to within ±2 F.

It has been found in practice that the effects of visible and solar radiation are very important in some instances and should be considered. It is possible that these effects can be separated from the low temperature radiation effects, but the desirability of this separation is controversial from a comfort measurement viewpoint and the best method of handling them is to be determined.

Future Development

A considerable amount of work has been directed toward developing radiometers which will be smaller in physical size, have faster response to environmental changes, and which will have an improved temperature control system. These advancements will be made possible by improved construction and heater design techniques, and by the availability of small composite hermetic seal units.

One model which is planned will feature electric heating of only a single sphere. In this case, the difference in equilibrium temperatures of the spheres will be measured and heat added to the cooler sphere to bring it up to the equilibrium temperature of the other. If the MRT is below air temperature, it will be necessary to add heat to the black sphere. If, on the other hand, the MRT is above air temperature it will be necessary to heat the polished sphere. This operating principle will eliminate primary heating and minimize the temperature difference between the spheres and the MRT. Min-

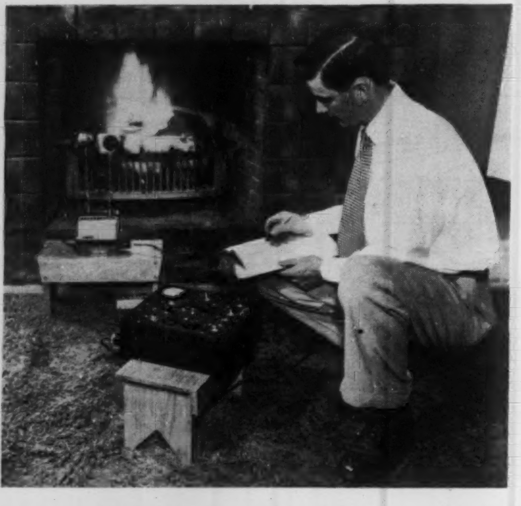

Fig. 8—Typical radiometer test setup

imizing this difference reduces the MRT error potential of the instrument. With the proposed instrument it will be necessary to measure both sphere temperature and heat input to determine the MRT, but a simple method of combining these two factors into a single approximate indication is being considered. It is hoped that the instrument can be used in conjunction with a recording potentiometer to give a continuous MRT indication.

Acknowledgment

Acknowledgment is made of the advice and assistance provided by staff members of the Minneapolis-Honeywell Research Center where this project was carried on.

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Discussion

G. V. Parmelee, Cleveland, Ohio, complimented the authors for their work in applying the principle of polished and black spheres to an instrument which could be operated very simply. He stated that the Building Research Station in Watford, England, is applying the same principle to two hollow heated man-sized metal objects having two internal fans to provide uniform temperature distribution, and 22 external thermocouples for measuring surface temperature. This latter instrument and its control panel are rather bulky, but probably could be used to obtain the mean radiant temperature with respect to a full-sized human being.

John Everetts, Jr., Philadelphia, Pa. emphasized the importance of having an instrument which could be used in the evaluation of environmental conditions involving radiation. Since the instrument developed by the authors appeared to be very useful for this purpose he asked several questions:

1. What is the effect of a point source of high temperature radiation such as an incandescent light on the black and the polished spheres?
2. How important would solar radiation effect be if a mean radiant temperature were being obtained in the presence of a south window?
3. What effect would the dimensions of the room have upon the readings obtained by the instrument?
4. Has any attempt been made by means of this instrument to determine the effect of the mean radiant temperature on a moist surface?

A. J. Hess, Los Angeles, Calif., pointed out that authors who developed instruments of this type rarely received the appreciation which was deserved because the number of such instruments sold would be rather small. The instrument, however, would be extremely valuable in research on human comfort.

L. F. Schutrum, Cleveland, Ohio, suggested that the instrument was probably more accurate than the authors considered it to be, and consequently that its precision would be greater than ± 2 deg.

J. M. van Nieukerken, New York, N. Y., pointed out that this type of instrument had been needed for a long time for use in the development of radiant heating. He inquired whether the authors felt that it would be possible to produce an instrument which would take temperatures from all directions; in other words, a directional instrument.

Authors' Closure — Mr. Sutton, in giving the authors' closure stated that a high temperature point source would have a great effect on the instrument at a distance of 1 ft or less. At a greater distance, however, the angularity effect is so small that in most cases there would be practically no effect upon the reading of the instrument. Mr. Sutton did not consider it possible to take full account of the solar radiation effect on the human body by means of this instrument. This would partly be due to the fact that solar radiation which did not strike the occupant could be absorbed by other sources and later re-radiated at lower temperature to the occupant.

Mr. Sutton felt that in any normally-sized room the sphere was so small in comparison to the enclosure that it would not be necessary to make any allowance for the size of the room.

In replying to Mr. Schutrum, the author stated that at present there was no exact method for calibrating the instrument and it was necessary to rely upon the use of a theoretical background. An attempt is being made to develop a calibration chamber. Mr. Sutton answered Mr. van Nieukerken by stating that the authors had developed a non-directional instrument because there seemed, at the present time, to be more instruments available for measurement of direction effects than for non-directional effects.

A sample of the instrument was placed on display, and the audience was invited to examine it and ask further questions after the meeting.

THE ROAD AHEAD FOR 1954

Dear Members:

The appearance of a monthly letter in the pages of our JOURNAL from the President of ASHVE probably requires an explanation. The idea was suggested by our Long Range Planning Committee and approved by Council. It was felt that this could be a means of keeping our members better informed on the aims, policies, accomplishments and current activities of the Society.

We wish to encourage comments on any phase of the Society's operations. Constructive criticism, helpful in many ways, will be appreciated. This is a source of valuable suggestions for improving services to our members and to the public. Past criticisms have sometimes emphasized the inadequacy of our public relations program. Future letters will include discussions on this and on some Society activities. We hope to clarify our purposes and objectives; also explain some of the limitations under which we, as a technical professional society, must operate.

Since this is our first letter, it seems appropriate for us to mention some of the problems we face in 1954. Most of these were brought before the Chapters Conference Committee at the 60th Annual Meeting in Houston, and several members expressed keen interest in learning more about them. Space limits permit only brief reference to our most important problems.

Research: Our research activity, from its beginning, has been a great prestige builder for the Society. Our research deserves its wide recognition because it has **advanced the arts and sciences** of our great profession and industry. We, who are responsible for directing Society activities believe, however, that we can make future research accomplish much more for us than our past efforts. To do this we must, first, solve several problems.

The unfortunate and sudden passing of our Director of Research, Cyril Tasker, created the additional problem of finding a new director. Our Council and Committee on Research both properly feel that a decision regarding a permanent director should be delayed until we are certain we have obtained the most competent man for the job. This means that everyone involved must spend considerable time interviewing candidates, studying their past records and considering their suitability for this responsibility.

Another part of the problem involves a critical study of our research program itself. The present program is commendable and worthy of support, but it should be expanded to cover some fields of interest in which basic research data are inadequate.

A more adequate research program will not be possible without additional financing. Consequently, we are faced with the difficult problem of raising much more money for research than we have ever needed. This requires more intensive selling of our research and its possibilities than we have been able to do in the past. Plans are now under way to develop this activity.

One of the most important phases of any fund raising activity is promotion and public relations. Indeed, our public relations program, insofar as Society research is concerned, must go beyond the scope of fund raising. We begin to realize, more and more, that we have not kept our own members, or the public, well enough informed on our research and its possibilities. We have not made it clear that we must work under certain limitations in planning our research. The significance and possible application of our research results have not been comprehensively emphasized. It has been often suggested that results be presented in a **more readable form.** This requires the services of technical writers who can rewrite highly technical research papers in layman language for wider reader interest.

Chapters: Our Society is very proud of its many fine Chapters. They are a highly important part of our activities. To our members who do not attend our Annual and Semi-Annual Meetings, the Chapter is the Society. Chapter meetings should, therefore, be well conducted and each member and guest made to feel that he has benefited professionally. More will be said about Chapters in a future letter. We need to review, immediately, several new potential Chapters to determine if they can qualify for a charter. A study of ways and means to improve Chapter operation is imperative. Chapter problems could best be administered by having someone on our headquarters staff devote full time to membership and Chapter matters.

Membership: Council and our Membership Committee have long felt that there are too many competent engineers in our profession who are not ASHVE members. For more than a year, a membership program has operated to induce these people to join the Society. We will continue, of course, to maintain our somewhat rigid qualifications for membership, but we feel our Society can best accomplish its worthy objectives by having as many qualified members as possible.

Publications: I am happy to report that by June 1954, **Transactions** will be published currently. We cannot enlarge **The Guide** appreciably without running into increased publication costs as a different method of binding will be required. There is need for additional technical information; also additional advertising to defray increased costs of publication and rising costs of mailing. A committee is now studying the problem and is expected to recommend new procedures.

Suggestions come in on improvement of our **Journal Section** of Heating, Piping & Air Conditioning. Some wish to have technical papers briefer and in more readable form. Opinions are not unanimous on this, however. Some feel the engineer should take the papers as they are now written and develop the application data. Many think we should include more news on Society activities. These matters are under consideration and we hope some progress will soon be evident.

Publicity and Public Relations: According to our By-Laws, our Society is dedicated to service for **the benefit of the general public.** The public will be fully benefited by our good work only if we publicize our accomplishments. Otherwise, the results of our efforts will lie dormant, and be of much less value. A publicity and public relations program is a desirable activity and a definite responsibility for us. Council has authorized our proceeding with such a program as quickly as possible.

Meetings: Our Annual and Semi-Annual Meetings, for several years, have been quite successful. Radical changes are not likely, but some possible improvements are under consideration. For a year or two before the war, the Society held spring and fall regional meetings concurrently with Council meetings. The advisability of reviving these meetings is being considered.

Codes and Standards: Council has definitely taken the stand that the Society develop new codes and standards. The By-Laws were revised at Houston for appointment of a Standards Committee with greater continuity of membership. Restrictions were removed regarding committee membership. An active program requires a man on our headquarters staff who can devote most of his time to codes and standards. A qualified man has proven difficult to find.

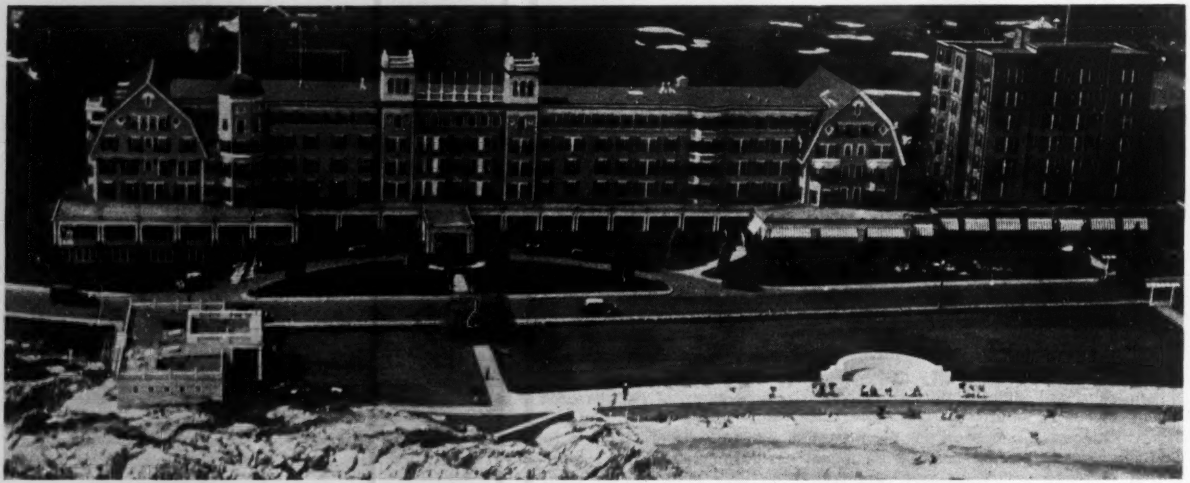
Long Range Planning: One of our most active units, this year, will be our Long Range Planning Committee. It will study our present activities and policies, and possible new ones, offering recommendations to Council on the long range aspects of our objectives. It will help us plan and complete future activities, also suggest methods of financing our programs, and determine what space and personnel are needed.

Personnel: You who have been kind enough to read this far must realize that our greatest need is additional personnel. We need a technical man to handle codes and standards, a publicity and public relations man, a permanent director of research, a fund raiser for research, a man to deal exclusively with membership and chapter problems, and technical writers. If these men were on our payroll today, and if we had funds for their salaries, we would not have sufficient space for all. We must soon find larger quarters for our headquarters offices.

It is impossible to predict now, how much of this program will be accomplished this year. I foresee no serious obstacle to considerable progress; I am sure my optimism is shared by the other Officers and Council.

Next month we will discuss one or two of our activities in greater detail.

Cordially yours,
L. N. HUNTER, President



Aerial view of New Ocean House showing private bathing beach in front

Swampscott Scene of Semi-Annual Meeting

June 28-30, 1954

SWAMPSCOTT, MASSACHUSETTS, nine miles from Boston, on the scenic and historic North Shore will be the site of the Society's Semi-Annual Meeting June 28-30, 1954.

The famous New Ocean House situated on the edge of the Atlantic will be the meeting headquarters, and members will find its large rooms and verandas overlooking the ocean a pleasant contrast to the rush and noise of the city.

The Committee on Arrangements headed by Council Member R. T. Kern, Fitchburg, as chairman and A. L. Hare, Boston, as vice-chairman, has already started planning activities to make this meeting a long-to-be remembered event.

Members will have an opportunity to test their sea legs on an all-day boat trip Sunday which will take the visitors across Massachusetts Bay to Provincetown, at the tip of Cape Cod. Here on the sandy dunes of *the Cape* are many houses dating from the mid-17th century.

Prof. B. H. Spurlock, Jr., chairman, Program and Papers Committee, has announced that an excellent group of technical papers will feature the technical sessions. The meeting will be climaxed with the Banquet on Wednesday night.

Golf Tourney

The Annual Golf Tournament featuring competition for the Research Cup and the Eichberg Memorial Trophy, for chapter team play, is scheduled for Monday afternoon. The Paul Bunyan Cup will also be presented to a member having high gross.

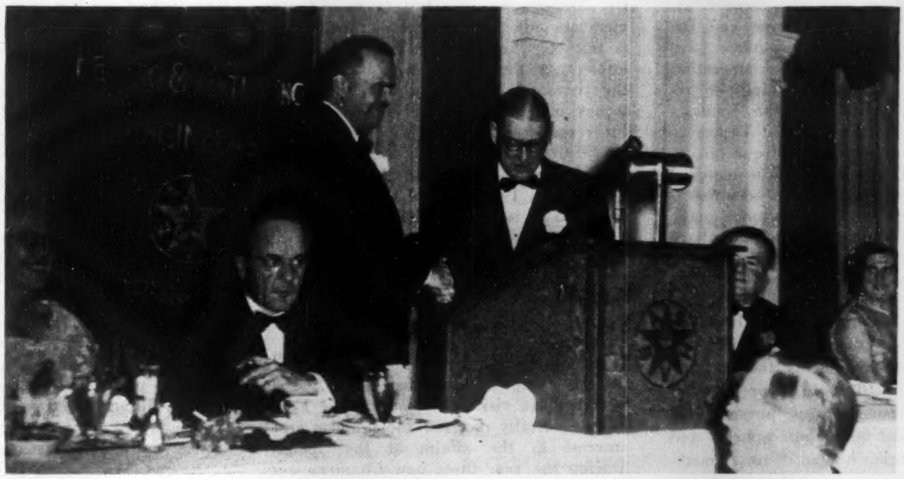
Sightseeing to Historic Places

Sightseeing trips to nearby places will enable members to show their children the homes of the men and places which figure so prominently in America's early history. Only a short drive from Swampscott, are found the home of Paul Revere, Lexington and Concord, Bunker Hill Monument (which is actually on Breed's Hill), the frigate *Constitution,* more familiarly known as *Old Ironsides,* Old North Church, Plymouth Rock, the enchanting town of Marblehead with its narrow streets winding around like the cow paths of old. This town, adjoining Swampscott, has interesting old houses and the rustic cottages of fishermen which attract artists from all over the nation.

Salem, scene of the storied witch trials, and the House of the Seven Gables, is but a short distance from Swampscott. Somewhat farther on is Gloucester, one of the most famous fishing ports in the world and a town which has preserved much of its picturesque quality through the years.

A trip to Swampscott can conveniently be combined with a drive through other beautiful sections of New England and perhaps a tour of eastern Canada, the Berkshires, or a visit to New York City and other points of interest. Swampscott is reached by the Boston and Maine railroad from Boston and by air to Boston via American, Eastern, Northeastern, TWA, and United. There is through train service to Boston from the South on the New York, New Haven and Hartford and from the West on the Boston and Albany. Come by plane or train or automobile, but plan to bring the family and enjoy the hospitality of the *Bay State* and the Society's third oldest Chapter, June 28-30, 1954.

JOURNAL SECTION



At the 60th Annual Banquet of ASHVE at Rice Hotel, Houston. Installation of Pres.-Elect L. N. Hunter by retiring Pres. Reg. F. Taylor. (*Seated l. to r.*) Mrs. Taylor, Dr. W. W. Kemmerer, C. Rollins Gardner, toastmaster, and Mrs. L. N. Hunter

Proceedings — 60th Annual Meeting Houston, Tex.

WITH attendance at technical sessions at an all-time high in both numbers and interest and with nearly all the entertainment events a virtual sell-out, the 60th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS was a tremendous success. Attendance figures for a non-exposition meeting were exceeded when the final count showed a total of 1102 registrants. There were 607 members, 272 ladies and 223 guests registered from 36 states, Canada, Mexico and points as far distant as Stockholm, Sweden.

FIRST SESSION, MONDAY, JANUARY 25, 9:30 A.M.

The 60th Annual Meeting was called to order in the Ballroom of the Rice Hotel, Houston, Tex., by Pres. Reg. F. Taylor, who introduced D. M. Mills, general chairman of the Committee on Arrangements.

Mr. Mills gave an outline of the plans made for the entertainment of the members and guests, and introduced the chairmen of the various committees as follows: *Banquet*—A. B. Ullrich, Jr.; *Entertainment*—F. M. Neil; *Finance*—A. J. Natkin; *Ladies*—C. L. Fleming; *Publicity*—B. P. Fisher; *Reception*—E. G. Floeter; *Sessions*—I. A. Naman; *Special Events*—H. W. Broadwell; and *Transportation*—A. F. Barnes.

President Taylor gave his report reviewing the growth of the Society, and pointing out the progress made during the past year.

Report of President

It seems appropriate to call to your attention, that this is the 60th Annual Meeting of the Society, and consequently we perhaps can be pardoned if we pause for a moment and look back on our accomplishments of six decades.

It is to be remembered that at its inception the Society had a charter membership of 75, and now many chapters exceed this figure in membership when they are chartered. It has had some brilliant men at its head, men who contributed much of their abilities, time and money to the welfare of the Society.

The Society was 21 years old when I joined it in 1915, 39 years ago. At that time there were about 500 members and there were but three chapters. These were Illinois, originated in 1906, New York originated in 1911 and Massachusetts originated in 1912. Today, there are approximately 9,300 members, with a net gain this past year of 900 members. There are also 56 Chapters, 9 Student Branches and of course, the Special Branch at Zurich, Switzerland.

From the very first, the Society was interested in publications, standards, and research. Its first publication, known as the TRANSACTIONS, was published in 1895, and annually since that date. As you know, the TRANSACTIONS contain scientific papers, discussions at meetings, Committee reports and Codes. Its next publication was THE JOURNAL, started in 1915. Now, THE JOURNAL comes to members each month as a special section of *Heating, Piping & Air Conditioning.*

The next publication was THE HEATING, VENTILATING, AIR CONDITIONING GUIDE, first published in 1922. THE GUIDE exerts today, one of the most positive influences tending to elevate, improve and extend the whole art and industry of heating, ventilating and air conditioning. It is universally recognized as the most useful and authoritative work in its field. Its current circulation is between 17,000 and 18,000 copies.

Until 1919, the Society carried out its research and investigative work only through Committees, which availed themselves of whatever facilities were offered by educational, governmental or industrial institutions. In 1919, the Society established its Research Laboratory in the U. S. Bureau of Mines at Pittsburgh, Pa. under

Dean John R. Allen and later Dean L. A. Scipio, Dean F. Paul Anderson, and Dr. Ferry C. Houghten. The Bureau gave most generous assistance and cooperation to the Society in accomplishing its research programs. In 1944, the Society's Research Laboratory with Cyril Tasker as director, was moved to limited quarters in Cleveland, Ohio, where in 1946 it acquired the large quarters that it now occupies.

Certain discoveries of importance made in the Society's Research Laboratory have led to the perfection of the Nicholl's Heat Meter and the Anderson-Armspach Dust Determinator. Other specific major accomplishments of the Society's Research are represented by the following subjects: heat-transmission coefficients for building materials; thermodynamic properties of air and water vapor mixtures; physiological effects of hot and humid atmospheres and means of alleviating human distress; methods of measurement; physical laws governing the behavior of air distribution jets; fundamental design data for steam and hot water systems; and heating and cooling load calculations. The Comfort Chart established by the Society is also a universally accepted standard.

From the brief resume I have just given you, you can readily see that during the past 60 years, the Society has contributed heavily to the arts and sciences of heating, ventilating and air conditioning and in so doing, has met the requirements of its Charter and the ideals of its founders.

In regard to the year now coming to an end, the Society was indeed unfortunate in losing five of its illustrious members. First, on May 27, the Director of Research, Cyril Tasker died; on June 28 Dr. F. E. Giesecke passed away in New Braunfels, Tex.; on July 3 Dr. Homer Addams was lost to us, followed by Louis A. Harding, July 8 and Prof. G. L. Larson, August 16. Dr. Addams was the last of the Charter members and for that reason his passing is felt very keenly. Dr. Addams' intense interest in the Society was indicated by the terms of his will, wherein he left a legacy of $10,000 to ASHVE to be used for research purposes. Mr. Harding was president of the Society in 1930; Professor Larson was president in 1936 and Dr. Giesecke in 1940. All of these fine members will be missed very much.

You will receive other reports which will give you valuable information on the activities of the Society. It is, therefore, unnecessary for me to go into any great detail. However, as a whole the Society is in excellent condition.

During the year I have visited a majority of the Chapters and the other Society officers have visited a good many. I was enthusiastically received and found a great interest in the affairs of the Society. During the year three new Chapters were added, these being the Mississippi Chapter at Jackson, Miss., the West Texas Chapter at Lubbock, Texas and the Arizona Chapter at Phoenix, Arizona and on Sunday, January 24, Council granted a charter for the 56th chapter at Columbia, S. C., to be known as the South Carolina Chapter.

I would like to note, that a very important committee was appointed by Council at its June Meeting. This committee is the Long Range Planning Committee. The members of this committee are J. E. Haines, Minneapolis, Minn., *Chairman;* P. B. Gordon, New York, N. Y.; A. J. Hess, Los Angeles, Calif.; John W. James, Chicago, Ill.; J. D. Kroeker, Portland, Ore. and L. E. Seeley, Durham, N. H. Council, by resolution, directed this committee to, *make the necessary studies to prepare and recommend to Council long range planning on future aims and activities of the Society, including recommendations on the items outlined in Article IV of the Society's Charter, as well as any other items, which in the opinion of the Long Range Planning Committee would affect the future welfare and growth of the Society.* This committee has been holding meetings, but its scope is so large and diversified it may take some time to thoroughly investigate all phases of the Society's operations.

Before I close, I must express my grateful appreciation of the assistance and cooperation I have received from the officers, the council members, chairmen of committees, and others in carrying on Society affairs. I acknowledge also, the great assistance rendered by the staffs of the New York Office and the Laboratory and particularly the cooperation of our extremely efficient executive secretary, A. V. Hutchinson. For myself, I can say it has been a great privilege to serve and work with you in filling the office of president of the Society.

Respectfully submitted,
Reg. F. Taylor, *President*

Report of Treasurer

Treas. John W. James, Chicago, Ill., presented the Treasurer's Report and said that additional figures from the accountant's report for the fiscal year ending October 31, 1953 would appear in the JOURNAL. He reviewed the significant figures in the accountant's report and gave a consolidated budget and expenditure comparison for the fiscal year. With the aid of slides, Mr. James pointed out that the 40 percent of members' dues or approximately $64,000, was about 40 percent of the total research income, the other 60 percent being contributions from industry, a Navy contract, and the research reserve fund.

1952-1953 ASHVE CONSOLIDATED CASH BUDGET COMPARISON

	Budget 12 Months	Actual 12 Months
INCOME:		
Headquarters:		
A — Dues (60 percent)	$122,670	$119,929.93
B — Publications	159,500	162,569.48
C — Investments	1,000	927.09
D — Other Income	2,400	3,131.50
	$285,570	$286,558.00
Research — E		
Dues	63,390	64,080.37
Contributions	70,000	46,616.37
Navy Contract	24,500	35,932.37
Interest	500	563.20
Transfer from Reserve	20,000	20,000.00
	$178,390	$167,192.31
TOTAL INCOME	$463,960	$453,750.31
EXPENSES:		
Headquarters:		
F — Committees and Chapters	$ 21,550	$ 21,220.90
G — Meetings	8,500	7,923.53
H — Publications	112,300	122,176.42*
I — Headquarters	128,650	128,707.98
K — Fund Raising	15,500	11,551.07
	$286,500	$291,579.90
Research — J		
Committee Expense	$ 5,500	$ 4,210.46
Staff Salaries	91,450	79,161.51
Laboratory Expenses	20,500	17,716.52
Building Operation & Maintenance	13,000	10,002.05**
Cooperative Research	29,200	22,025.66
Navy Contract	17,800	24,834.26
	$177,450	$157,950.46
TOTAL EXPENSES	$463,950	$449,530.36
Budgeted Excess	+ 10	+ 4,219.95
Special Appropriations:		
Membership Campaign	1,200	723.37
AMA Physiological Exhibit	1,500	1,500.00
Actual Excess	$−2,690	$+1,996.58

Respectfully submitted,
JOHN W. JAMES, *Treasurer*

*Deducted $11,619.55 from Publications chargeable to prior years TRANSACTIONS, and added **$2,000 chargeable to Building Maintenance.

Accountants Report

Frank G. Tusa & Co.
CERTIFIED PUBLIC ACCOUNTANTS
37 WALL STREET
NEW YORK 5, N. Y.

The American Society of Heating
and Ventilating Engineers
62 Worth Street,
New York, N. Y.

Gentlemen:

Pursuant to your request, we examined the books of account and records of The American Society of Heating and Ventilating Engineers — New York, N. Y. and Cleveland and its related funds for the fiscal year ended October 31, 1953 and submit herewith our report.

The audit covered a verification of the Assets and Liabilities as of the close of business October 31, 1953. For the fiscal year then ended, the recorded cash receipts were traced into the depositories; the cancelled bank checks were inspected and compared with the record of cash disbursements, and the disbursements were supported by payment vouchers. The dues from members and the interest from investments were accounted for.

A Balance Sheet reflecting the financial condition of the Society as of the close of business October 31, 1953 is submitted herewith and your attention is directed to the following comments thereon:

CASH

The cash on deposit was verified by direct communication with commercial and savings banks and the balances reported to us were reconciled with those reflected by the books of the Society. A schedule of cash is included as a part of this report.

Checks representing the cash on hand for deposit were inspected by us and the cash on hand was counted.

MARKETABLE SECURITIES

The securities shown on the subjoined schedule were verified by direct communication with the Bankers Trust Company, where same are deposited for safe-keeping. Securities have been included in the accompanying balance sheet at the cost of acquisition plus the accumulated and accrued interest earned thereon.

ACCOUNTS RECEIVABLE

Trial balances taken of the membership dues receivable and sundry debtors as of the close of business October 31, 1953 were classified and aged as follows:

MEMBERSHIP	PRIOR	1953	TOTAL
Members	$	$ 3,206.25	$ 3,206.25
Associates	50.48	3,218.75	3,269.23
Affiliates		1,979.25	1,979.25
Juniors		1,604.83	1,604.83
Students	1.00	18.00	19.00
Total	$51.48	$10,027.08	$10,078.56

SUNDRY DEBTORS

Unpaid charges made during 1953	$ 5,600.01
Unpaid charges made during 1952	437.42
Total	$ 6,037.43

After writing off all receivables known to be uncollectible, it is our opinion that reserves for dues and accounts receivable doubtful of collection reflected in the accompanying Balance Sheet are ample to cover collection losses that may be incurred.

RESEARCH FUND ACCOUNTS RECEIVABLE

The balance due to the Research Fund from the Society as at October 31, 1953 represents the unpaid balance of 40% of the dues receivable from members, associates, and affiliates as of such date.

Included in the miscellaneous accounts receivable of $303.70 is an amount due from the Estate of Cyril Tasker for $295.69. This represents travel advances of $450.00 not accounted for to Research, less an adjustment of $154.31 due to the Estate for amounts with-held on account of insurance premiums advanced to the Pension Trust for the account of Mr. Tasker.

INVENTORIES

The following inventories were verified either by physical count or direct communications.

Transactions	$ 8,644.49
Emblems	585.15
Guide Paper	7,831.60
Membership Roll Paper	200.00
Membership Roll Books	2,214.00
Total	$19,475.24

A schedule of Transactions inventoried follows:

VOLUME	YEAR	QUANTITY	PRICE	AMOUNT
1-51	1895-1945	3,616	.40	$1,446.40
52	1946	404	1.67	674.68
53	1947	161	1.77	284.97
54	1948	787	1.78	1,400.86
55	1949	278	2.02	561.56
56	1950	705	2.08	1,466.40
57	1951	1,235	2.275	2,809.62
Total				$8,644.49

DEPOSITS RECEIVABLE

The deposit placed with the United Airlines in the sum of $425.00 was verified by direct communication.

ADVANCES

The indebtedness from employees in New York and Cleveland represents advances to the employees retirement plan in the sums of $1,352.54 and $835.90 respectively. This indebtedness representing one years advance premiums is to be reimbursed by the trust during the ensuing fiscal year.

DEFERRED CHARGES

The following prepayments have been deferred to future operations:

H.P.A.C. Subscriptions	$ 3,008.61
Insurance Premiums — Cleveland	1,977.74
Insurance Premiums — New York	182.86
Transactions — Volume 59	14.69
Total	$ 5,183.90

PERMANENT ASSETS

The land and buildings, instruments, equipment and furniture and fixtures are reflected on the balance sheet at cost of acquisition. With the exception of land and buildings all assets have been depreciated at the rate of 10 percent per annum. During the year fully depreciated Furniture and Fixtures in the amount of $219.68 was written off against the reserve.

In accordance with the resolution adopted by the Council at its meeting of January 23, 1949 depreciation was not provided on the buildings for the current fiscal year.

TAXES

The sum of $1,526.00 represents Federal income taxes withheld from employees salaries during the month of October, 1953.

DEFERRED INCOME

The prepaid dues and initiation fees by members and candidates for membership have been deferred to future operations. The membership classification of the dues prepaid by elected members follow:

MEMBERSHIP	AMOUNT
Members	$ 580.44
Associates	227.37
Affiliates	438.25
Juniors	558.52
Students	19.50
Total	$ 1,824.08

RESERVE FOR TRANSACTIONS

Out of the original $13,500.00 provided for Transactions Volume 58 there remains an unexpended balance of $13,476.25, which is reflected in the accompanying balance sheet.

RESERVE FOR BUILDING MAINTENANCE

On October 31, 1952 the Council voted:

"That disbursements be made from the Building and Maintenance Reserve Fund as authorized by the Building Committee for major items of repair and maintenance, but any balance remaining in the fund beyond the expenditures for each year would go into reserve until the Building Maintenance Reserve Fund reached a total of $10,000.00.

Inasmuch as there were no disbursements authorized as at the end of the current fiscal year, there exists a reserve balance of $4,000.00 as at October 31, 1953.

FUNDS

There is included as a part of this report an analysis of funds reflecting the changes that occurred therein during the fiscal year ended October 31, 1953.

INSURANCE

The insurance coverage of the Society follows:

FIRE		
Building (Cleveland)		$201,000.00
Personal Property:		
Cleveland	$104,000.00	
New York	25,500.00	
Printers	12,000.00	141,500.00
SPRINKLER LEAKAGE		
Waverly Press	10,000.00	
Hawes and Petit	2,000.00	12,000.00
NON-OWNERSHIP — AUTOMOBILE — COMPREHENSIVE		
Public Liability		100/300M
Property Damage		25M
Medical		1M
GENERAL PUBLIC LIABILITY — PREMISES		
New York and Cleveland		
Liability		100/300M
Bodily Injury		25/100M
COMMERCIAL BLANKET BOND		
All employees including the President, Treasurer and Chairman of the Finance Committee		20,000.00

Respectfully submitted,

FRANK G. TUSA & CO.
CERTIFIED PUBLIC ACCOUNTANTS

BALANCE SHEET

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS — New York, N. Y.
October 31, 1953

ASSETS

SOCIETY				
GENERAL FUND ASSETS				
CASH				
On Hand and on Deposit			$57,351.52	
SECURITIES				
At Cost (Market Value $3,680.00)		$3,782.36		
Add: Accrued Interest		27.50	3,809.86	
ACCOUNTS RECEIVABLE				
Membership Dues	$10,078.56			
Less: Reserve for Doubtful	6,047.13	4,031.43		
Advertisers and Sundry Debtors	6,037.43			
Less: Reserve for Doubtful	1,000.00	5,037.43		
Initiation Fees		80.00	9,148.86	
INVENTORIES			19,475.24	
DEPOSIT WITH UNITED AIRLINES			425.00	
ADVANCES TO EMPLOYEES PENSION TRUST			1,352.54	
DEFERRED CHARGES			3,206.16	
TOTAL SOCIETY GENERAL FUND ASSETS				$ 94,769.18
RESEARCH GENERAL FUND ASSETS				
CASH				
On Hand and on Deposit			36,136.42	
ACCOUNTS RECEIVABLE				
40% of Dues	4,497.14			
Less: Reserve for Doubtful	2,029.14	2,468.00		
Due from U.S. Navy Dept.		3,903.91		
Hospitalization — Employees		131.95		
Miscellaneous		303.70	6,807.56	
ADVANCES TO EMPLOYEES PENSION TRUST			835.90	
DEFERRED CHARGES			1,977.74	
TOTAL RESEARCH GENERAL FUND ASSETS				45,757.62
TOTAL ASSETS — COMBINED GENERAL FUNDS				$140,526.80

(FORWARDED)			$140,526.80
PROPERTY FUND			
Land and Buildings	$84,920.96		
Less: Reserve for Depreciation	3,908.07	$81,012.89	
Laboratory and Equipment (Cleveland)	65,744.42		
Less: Reserve for Depreciation	33,221.28	32,523.14	
Furniture and Fixtures (New York)	14,133.54		
Less: Reserve for Depreciation	4,867.81	9,265.73	
Library (Cleveland)		300.00	
Tools (Cleveland)		300.00	123,401.76
BUILDING FUND			
CASH			
On Hand and On Deposit		830.48	
SECURITIES			
At Cost (Market Value $36,719.50)	32,549.00		
Add: Accumulated and Accrued Interest	4,170.50	36,719.50	37,549.98
RESERVE FUND			
Cash on Deposit		20,343.02	
Securities at Cost (Market Value $66,659.00)	53,631.50		
Add: Accumulated Interest	13,027.50	66,659.00	87,002.02
ENDOWMENT FUNDS			
F. PAUL ANDERSON FUND			
Cash on Deposit		226.21	
Securities at Cost (Market Value $973.00)	1,000.00		
Add: Accrued Interest	12.50	1,012.50	1,238.71
RESEARCH FUND			
Cash on Deposit			721.85
RESEARCH RESERVE FUND			
Cash on Deposit			32,102.74
TOTAL ASSETS			$422,543.86

LIABILITIES

GENERAL FUND				
FEDERAL WITHHOLDING TAXES			$ 1,526.00	
DUE RESEARCH			2,468.00	
ACCRUED ACCOUNTS				
Salaries and Commissions		$11,268.24		
Professional Fees		1,000.00	12,268.24	
SUNDRY ACCOUNT PAYABLE			127.55	
DEFERRED INCOME				
Prepaid Membership Dues				
Elected Members	$1,824.08			
Candidates	1,012.50	2,836.58		
Prepaid Admission Fees		2,099.50	4,936.08	
RESERVE FOR PUBLICATIONS				
Transactions — Volume 58			13,476.25	
RESERVE FOR FLUCTUATION IN CANADIAN EXCHANGE			33.26	$ 34,835.38
RESEARCH FUND				
RESERVE FOR BUILDING MAINTENANCE			4,000.00	
DEFERRED INCOME				
Air Cleaning		2,179.00		
Sound Energy Studies		574.39		
Summer Infiltration		2,500.00		
Sorption		500.00	5,753.39	9,753.39

NET WORTH

Society General Fund	50,343.80	
Research General Fund	35,904.23	
Property Fund	123,401.76	
Building Fund	37,549.98	
Society Reserve Fund	96,692.02	
F. Paul Anderson Fund	1,238.71	
Research Endowment Fund	721.85	
Research Reserve Fund	32,102.74	377,955.09
TOTAL LIABILITIES AND NET WORTH		$422,543.86

COMPARATIVE STATEMENT OF INCOME AND EXPENSES

THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS — NEW YORK, N. Y.

For the fiscal year ended October 31, 1953 and October 31, 1952

	FISCAL YEAR ENDED OCTOBER 31, 1953	OCTOBER 31, 1952	INCREASES (DECREASES)
INCOME			
Income from Dues	$123,800.89	$113,564.65	$ 10,236.24
Admission Fees	9,690.00	7,243.00	2,447.00
Emblems, Pins, Etc.	1,172.00	626.88	545.12
PUBLICATIONS			
Journal Contracts	23,500.00	23,500.00	
Guide	132,973.58	126,846.41	6,127.17
Transactions	3,158.79	1,159.25	1,999.54
Books, Reprints, Codes, Etc.	3,446.80	3,016.95	429.85
Income from Investments	927.09	905.86	21.23
RESEARCH			
Dues	64,381.43	60,065.60	4,315.83
U.S. Navy Research	34,798.45	27,061.95	7,736.50
Contributions — General	17,535.37	19,272.94	(1,737.57)
Contributions — Earmarked	29,852.00	42,971.84	(13,119.84)
Interest	39.26	1.48	37.78
TOTAL INCOME	$445,275.66	$426,236.81	$ 19,038.85
EXPENSES			
Committees and Chapters	$ 20,995.59	$ 21,321.79	(326.20)
Meetings	5,923.53	5,001.30	922.23
PUBLICATIONS			
Members Subscriptions to H.P.A.C.	16,618.29	15,876.54	741.75
Transactions	21,737.45	15,006.26	6,731.19
Membership Roll	2,918.57	8,888.08	(5,969.51)
Books, Reprints, Codes, Etc.	2,510.91	2,499.54	11.37
Guide	83,128.64	81,201.60	1,927.04
Headquarters	128,687.05	114,270.99	14,416.06
Fund Raising	11,551.07	13,734.89	(2,183.82)
RESEARCH			
Committees Expenses	4,210.46	4,269.59	(59.13)
Staff Salaries	75,411.51	80,771.59	(5,360.08)
Laboratory Expenses	18,340.33	22,004.39	(3,664.06)
Building Operation and Maintenance	9,454.06	9,512.33	(58.27)
Provision for Building Maintenance Reserve	2,000.00	2,000.00	
U. S. Navy Research	24,834.26	17,839.83	6,994.43
Cooperative Research	22,025.66	28,454.52	(6,428.86)
Other Deductions	16,391.93	9,446.84	6,945.09
TOTAL EXPENSES	466,739.31	452,100.08	14,639.23
EXCESS OF INCOME OVER EXPENSES	($ 21,463.65)	($ 25,863.27)	($ 4,399.62)

A. V. Hutchinson, executive secretary, presented the Report of Council as follows:

Report of Council

As required by Section 46 of the Membership Corporations' Law of the State of New York the following report is presented by the Council and filed herewith:

Assets

The Society has the following Assets:

Land and Laboratory Buildings at Cleveland, Ohio	$ 81,012.89
Furniture and Equipment, Tools, etc. at New York and Cleveland	42,388.87
On Deposit in New York and Cleveland banks	147,712.24
Securities (United States and Utility Bonds) with Bankers Trust Company, New York as custodian	108,200.86
Accounts Receivable	13,052.77
Inventory Items	19,475.24
Deferred Items	5,183.90
Miscellaneous	3,049.09
Total	$420,075.86
1952 Total	384,920.41
Increase	$ 35,155.45

The sources of Society Cash Receipts were:

Admission Fees and Dues	$134,662.89
Publications	163,079.17
Interest	927.09
From Research	146,606.51
Total	$445,275.66

Cash Disbursements were:

Meetings, Committees and Chapters	$ 26,919.12
Publications	126,913.86
Headquarters	128,687.05
Fund Raising	11,551.07
Research	160,026.28
Total	$454,097.38

The Society's Reserve Fund was increased by the addition of $9,690.00 Admission Fees and $2,559.13 Interest earned on Savings, Bank Accounts and Securities. This is an increase of $12,249.13, bringing the Reserve Fund to $96,692.02.

Now in the Custodian Account of the Bankers Trust Co., New York, there are securities of the United States and Canadian Governments and a utility which cost: General Fund $3,782.36, Building Fund $32,549.00, Reserve Fund $53,631.50, and F. Paul Anderson Fund $1,000.00. The Research Reserve Fund now amounts to $32,102.74.

Liabilities

The Society has the following Liabilities:

Reserve for building maintenance	$ 4,000.00
Accounts Payable	127.55
Federal Withholding Taxes	1,526.00
Accrued Accounts	12,268.24
Deferred Income:	
Research Projects	5,753.39
Prepaid Dues, Initiation Fees, etc.	4,936.08
Reserve for TRANSACTIONS	13,476.25
Fluctuation in Canadian Exchange	33.26
Net Worth (Funds)	377,955.09
Total	$420,075.86

At the end of the fiscal year, October 31, 1953, the Balance Sheet shows the Society's Net Worth as $377,955.09 compared to $343,990.17 on October 31, 1952, a net gain of $33,964.92.

The insurance coverage of the Society is as follows: Fire for Buildings $201,000.00, for contents $41,500.00; sprinkler $12,000.00; Automobile Comprehensive Public Liability $100,000-$300,000.00, Property Damage $25,000.00, Medical $1,000.00; General Public Liability, Society Premises, Liability $100,000-$300,000.00, Bodily Injury $25,000-$100,000.00; Fidelity Bonds on Officers and all employees $20,000.00. Workmen's Compensation is carried in New York and Ohio, as required by law.

The Society has contributed to the Employees Retirement Plan Trust $2,417.21 and the participating employees contributed a similar amount deducted from salary.

Total cash in New York and Cleveland banks $147,712.24, consisting of $57,351.52 in General Operating Fund, $20,343.02 in Reserve Fund, $226.21 in F. Paul Anderson Fund, $36,136.42 in the Research Funds, $32,102.74 in Research Reserve, $721.85 in Research Endowment, and $830.48 in the Building Fund.

Membership

The Society admitted the following members in the grades indicated since January 1, 1953:

Members	329
Associates	11
Affiliates	446
Junior Members	393
Students	117
Total	1,296

The names and addresses of the candidates for membership were published in the JOURNAL of the Society each month during the year and are on record in the Secretary's office. The present membership total is 9298.

Respectfully submitted,
Reg. F. Taylor, *President*
John W. James, *Treasurer*

President Taylor announced that the next item of business was consideration of the amendments which had been introduced at the Semi-Annual Meeting 1953 at Denver.

In accordance with the By-Laws, members had been notified that a vote on approval of amendments would be taken at this meeting.

Vice Pres. L. N. Hunter moved the adoption of the following resolution:

Resolved, That *Article VII, Section 2* (*e*) of the Society's By-Laws be deleted, and

Be it further Resolved, That *Article VII, Section 3* of the By-Laws be amended by adding thereto a new subdivision (*j*) reading as follows:

> (*j*) Standards Committee, consisting of six (6) Members. The said committee shall consider all scientific questions and data pertaining to engineering codes and standards, initiate, and propose changes and improvements thereof for the public benefit, and report its recommendations to the Council.

The motion was seconded and, when put to a vote, was approved unanimously.

J. Donald Kroeker, Portland, Ore., moved the adoption of the following resolution:

Resolved, That the last sentence of *Article VIII, Section 7,* of the By-Laws be amended to read as follows:

> . . . . . The elected candidates shall be installed during the Annual Meeting and their terms shall commence at the close of the last session of the Annual Meeting.

The motion was seconded and approved unanimously.

President Taylor announced that the polls would be open for election of Officers, members of Council and Committee on Research, until 2:30 p.m. It was also announced that anyone who wished to withdraw his proxy could do so by advising the proxies. E. K. Campbell, Kansas City, Mo., C. R. Gardner, Fort Worth, Tex., or C. E. Price, Chicago, Ill.

The following Tellers of Election were appointed by the president: S. W. Beaty, Shreveport, La., *chairman;* A. B. Ullrich, Jr., and R. E. Haubold, Houston, Tex.

President Taylor introduced L. T. Mart, Kansas City, Mo., as chairman of the technical session.

Mr. Mart called attention to the rules for technical sessions and introduced W. W. Smith, College Station, Tex., who presented the paper, Prediction of Cooling Tower Performance, (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning,* October 1953).

H. E. DECLER, Kansas City, Mo. (WRITTEN): This paper is another milestone in the available ASHVE reference material on cooling tower performance. Of particular interest are the groups of curves (shown in Figs. 2, 3 and 4) which were prepared from test data and correlated calculations. However, photos and details of construction and operation of the experimental tower would have been of equal value. It would be useful to know the basic type of tower filling, the size and shape of the splash bars, their spacing horizontally and vertically, whether the water was pressure sprayed onto the top layer of fill, and correlated operational details.

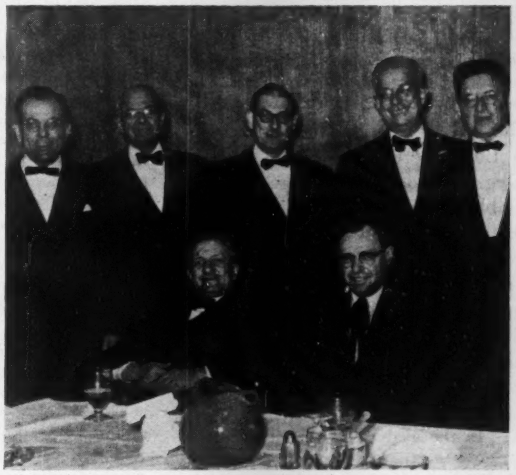
The writer made a number of exploratory calculations by applying this information to two models of our counterflow towers, using 0.75 to 2.5 liquid-gas ratios, 60 to 80 F wet-bulb temperatures, and 10 to 30 deg cooling range with 6 to 22 deg approach. The predicted performance with the use of Smith's graphs closely checked the actual capabilities of these towers.

In general, cooling tower performance improves with altitude. For a given tower, the same motor and fan horsepower would be used regardless of altitude, hence a greater volume of air is circulated than at sea level; this effect is attained by increasing the pitch of the fan blades. In the last sentence of his conclusions the author states that there would be a *quarter decrease in fan horsepower at 7000 ft elevation.* This is probably based upon the decrease in the pounds of air (reduced density) at an increase of the volume of air circulated; however, the enthalpy per pound of air increases with altitude. These compensating properties of air for altitude installations are reflected by the author in the section under Air Flow.

It should be mentioned that at elevations above 3300 ft, motor design modifications would be necessary to keep the motor within safe operating temperatures.

In line with Professor Smith's mention of the large number of curve drawings required for a more complete performance picture, we use hundreds of curves and several thousand tabulated figures for the basic rating and selection data for each cooling tower design. Some established manufacturers may have ten or more designs with different flow patterns and splash-bar arrangements for a wide variety of temperatures and capacities, each requiring a separate mathematical and graphical analysis including basic experimental correlation. Each American cooling tower manufacturer has a semi-confidential method of sizing towers based upon research and actual performance correlated with definite requirements.

John W. James and John E. Haines being installed by Pres. Reg. F. Taylor, as second and first vice presidents, respectively



The Past Presidents' Dinner (*standing l. to r.)* Merrill F. Blankin, Alfred E. Stacey, Jr., Reg. F. Taylor, Lester T. Avery, Walter L. Fleisher. (*Seated)* Ernest Szekely, and A. V. Hutchinson, executive secretary of ASHVE

Because of the many variables in cooling tower calculations and performance, it is difficult to provide simple, handbook equations, tables and graphs, whereby a non-specialist could readily select the type and size of tower for any one of the many possible combinations of desired water quantities, temperatures and applications.

T. J. Connolly* and J. C. Harper*, Los Angeles, Calif. (Written): The curves prepared by the author would be of use to plant operators in evaluating effects of changes in operating conditions and to engineers for preliminary design work. The curves presented are plots of solutions to the usual cooling tower equations, and the results should be considered as a convenient handbook type of information rather than as a fundamental contribution to cooling tower theory. It is difficult to understand how the compilation of a complete set of such curves would lead to a better understanding of cooling tower phenomena.

The reviewers would like to ask the author if he is familiar with the set of charts prepared by Foster Wheeler. In this collection there are approximately 450 charts identical to the author's Fig. 1, covering different wet-bulb temperatures and cooling ranges, but not including the effect of barometric pressure.

The value of this paper would be increased if the author were to give an estimate of the magnitude of the errors incurred by the use of Figs. 3, 4, and 5. These corrections must be affected to some extent by the value of L/G in addition to other variables included. The derivation of Equations 4 and 6 should also be given, together with any postulates made.

Experimental results with gas-liquid contacting equipment in general indicate that transfer coefficients vary approximately as the 0.8 power of G. The reviewers would like to ask if the result indicated in Equation 3 is typical, and what range of exponents of G might be expected.

H. B. Nottage, Encino, Calif. (Written): This paper is disappointing in its lack of useful and extensive experimental performance data which really would be needed to properly validate the performance prediction method. For instance, may we at least have the complete construction details and original test data for the tower(s) whose performance is given by Fig. 1?

Variations of this same method have recently been expounded by other authors, for example Baker and Mart[1] and Mickley.[2]

Mr. Mart referred to the work of the *Cooling Tower Institute,* and stated that attempts are being made to produce charts and methods by which the user can determine the extent to which a cooling tower fails to meet performance requirements. He felt that very good progress was being made on this project.

W. M. Wallace II, Durham, N. C., expressed the hope that work similar to that reported by the author would make it possible to prepare reference charts which could be used in making comparisons of cooling tower performance. He pointed out that available cooling tower data usually applied only to the product of the manufacturer publishing the data, and hence could not be used for determining performance of other towers.

The author made a number of comments on the discussions that had been received.

The second technical paper, Automobile Air Conditioning — Progress and Problems, by P. J. Kent, Detroit, Mich., (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning,* December 1953) was presented by the author.

H. B. Nottage, Encino, Calif. (Written): It is thoroughly agreed that the matter of a compressor drive is an outstandingly important problem. In this connection it is proper to look more broadly into the future.

1. Small turbo-compressors can be designed with minimum requirements for space and weight. Indeed, such units are in established production for the air cycle and can be built for vapor cycles also.
2. Lack of a small driving turbine, fully developed and available at a competitive price, is a major obstacle for turbo-compressors to be used in cars and trucks. Economic aspects are dominant, and constitute the usual challenge to engineers.
3. Turbine-driven automobiles and trucks are on the way. Among these, one possibility is a turbine-driven alternator, with electric motors on the wheels. This combination could provide plenty of flexible auxiliary power. Another possible type would be a free-piston compressor for

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*Department of Engineering, University of California.

[1] The Petroleum Refiner, by D. R. Baker and L. T. Mart, October 1952.

[2] Chemical Engineering Progress, by H. S. Mickley, Vol. 45, December 1949, p. 739.

the power turbine, and this certainly could amply supply small auxiliary turbine units.

Recognizing these points with their fullest implications, would the author wish to broaden his comments regarding the future for, say, 5, 10, and 20 years?

The third technical paper, Pressure Loss of Air Flowing Through 45-Degree Wooden Louvers, by P. R. Cobb, College Station, Tex., (published in the ASHVE Journal Section, *Heating, Piping & Air Conditioning,* December 1953) was presented by W. D. Scoates, manager of the Fan Testing Laboratory, Texas Engineering Experiment Station, College Station, Tex.

S. F. Gilman, Syracuse, N. Y. (Written): In the analysis section it is stated that the pressure loss *obviously depends upon the dimensions of the louver,* which means the geometry of the system. However, in the selection of the principal variables affecting the pressure loss and in the resultant dimensionless groups obtained by dimensional analysis, the geometry of the system remains unspecified. The free area fixes only the number of louvers and the angle ϕ, and these do not fix the geometry. The dimensionless groups actually apply only to the condition that geometrical similarity is maintained. That this condition is not fulfilled is easily seen by comparing the 3-louver and the 17-louver configurations. With only 3 louvers, the vertical distance between louvers, or what could be called the *slot height,* is more than 9 in. so that the length of the channel through which the air passes is less than one slot height. On the other hand, with 17 louvers there are a series of channels having a slot height less than 3/16 in. and a length of more than 40 slot heights. These are far from being geometrically similar; *i.e.,* far from having the same shape. Moreover, for such a wide range of slot heights the relative roughness of the channels changes considerably. Therefore, the dimensional analysis represents an oversimplification of the flow conditions. A characteristic dimension of the louver and the absolute roughness should have been included.

An additional figure in the paper showing the actual configuration of the louvers for at least 4 area ratios would have been valuable in analyzing some practical aspects. For example, since the 17 louver condition results in each louver board overlapping the inlets of the 4 boards above it, I doubt that the smaller area ratio configurations have any real practical significance.

Turning now to Fig. 3, it is seen that the pressure loss is independent of Reynolds number down to an area ratio of about 0.5. This means simply that the inertia forces are predominant, a fact which would be anticipated from the geometry. Below 0.5, the channel becomes long in comparison with the slot height and the influence of viscous forces becomes increasingly significant. This is shown by the variation in loss coefficient with Reynolds number for a constant area ratio. Here also we see a remarkable thing. Taking the area ratio of 0.2808 as an example, the curve indicates only a relatively small influence of viscous forces over a Reynolds number range from 460 to 1100. This is contrary to my expectation that viscous forces should be predominant below a Reynolds number of about 2300; in fact, for such low Reynolds numbers I would expect the flow to be laminar. If it were, the slopes of the constant area lines would be proportional to $64/R$ and consequently much steeper.

To resolve this contradiction to expectation, let us look at the author's definition of Reynolds number. Here we see that the hydraulic radius is based on the free area at the entrance to the louver, but the velocity refers to that in the inlet duct upstream. Recalling that the Reynolds number is the ratio of inertia to viscous forces, it is evident the definition of Reynolds number used in the paper is some viscous-inertia force combination obtained from two distinct regions of the flow. My questions are, therefore:

1. Is this really a Reynolds number at all in the true sense of the definition?
2. What particular significance does the author attach to such a definition of Reynolds number?

It seems to me that more importance is given to the variable V, the average velocity in the inlet duct, than it deserves. Moreover, as will be demonstrated, it overcomplicates the final results. Now certainly the pressure loss of a louver will be influenced by the flow conditions within the louver; therefore, the velocity V' should logically appear in the Reynolds number and loss coefficient axes of Fig. 3. We convert to such a basis by multiplying the $P/\rho V^2$ values by the square of the area ratio and dividing the Reynolds number values by the area ratio. When this is done, a not-so-surprising thing happens. Within experimental accuracy the 10 curves in Fig. 3 for area ratios between 0.8893 and 0.3914 are reduced to the single value of 1.4. This means that the deviations from geometrical similarity for these 10 configurations have an insignificant effect on the flow conditions, and therefore the pressure loss for all 10 area ratios can be expressed as 1.4 velocity heads referred to the mean velocity at the louver inlet slots. This not only simplifies the present Fig. 3 considerably but in addition eliminates the need for Fig. 4.

I do not agree with the author's conclusion that the velocity of the approach air is the principal variable affecting the pressure loss. The principal variables are the flow conditions within the louver boards, and not the conditions of the approaching flow. The fact that the two are connected through the continuity equation is not justification for the conclusion that V, instead of V' is of significance.

In summary, for all really practicable louver configurations the results of this paper can be expressed as 1.4 velocity heads referred to the mean velocity at the inlet slots, and this is all the designer needs to know.

F. W. Rabe, Dallas, Tex. (Written): The author refers to louvers on cooling tower walls. It is assumed, therefore, that pressure loss determinations as given by Equation 3, for instance, apply to cooling tower louvers. A common application of louvers for cooling towers is the air intake-louvers of a conventionally designed counterflow induced draft tower. These louvers are usually located between the tower packing and the water basin. The air which leaves these louvers is turned and deflected aproximately 135 deg before it enters the tower packing. If such louvers were provided with an inlet duct, similar to the one used by the author in the test equipment, the direction of the air would be changed both at the entrance and at exit from the louver. Air flowing through the louvers tested was deflected only 45 deg.

It is assumed that nearly uniform air velocities were maintained at all points of the louvers for a given test condition. In practice it is found that the air velocity through cooling tower louvers, such as described, is not uniform. The velocity of the air near the top of the louver is, in some cases, considerably higher than the velocity near the bottom. The reason for this difference in air velocities becomes obvious when the flow pattern of the air in a cooling tower, as outlined, is carefully analyzed. Average readings of louver air velocities, taken at a large cooling tower, varied from 963 fpm at the top to 353 fpm at the bottom of the louver. Readings taken midway between top and bottom indicated air velocities intermediate to those cited.

Conditions under which the louver tests were made did not assimilate air-flow conditions through cooling tower louvers as discussed. It is, therefore, doubtful if the determination of pressure loss as, for instance, given by Equation 3 applies to louvers if installed on a cooling tower as described. The air velocity V as used in Equation 3 denotes the average velocity of air through the inlet duct. Few, if any, louvers are equipped with such inlet ducts and it would, therefore, be of interest to know what effect, if any, the addition of an inlet duct has on the air-flow resistance.

There is a definite need for practical and reliable data giving air pressure losses through louvers. Considering this paper from a practical engineering point of view, it would seem that too much space is devoted to test procedure and test data and too little to the gist of the problem. These comments are in no way intended to detract from the value of the paper, which it is hoped will stimulate others to continue this investigation. The author is to be commended for the work he has done.

H. B. NOTTAGE, Encino, Calif. (WRITTEN): In order to broaden and expedite use of the data presented, it is suggested that the author should further clarify how the groups π_2, π_3, π_4 include *all* the details of louver geometry and yet are the *best* independent moduli for correlation.

Such a clarification should save reader time in applying the data to other designs. In this regard, how far does the author feel that one might extend the data presented in Fig. 3 beyond the particular test range? If such an extension cannot be made at all, then why use dimensionless moduli?

R. W. MCKINLEY, Pittsburgh, Pa., asked the author whether the pressure loss data given in the paper would apply equally well to metal louvers having cross section areas such as found in venetian blinds with small metal slats. He asked also whether the data could be applied to venetian blinds having curved metal slats.

CHARLES BEVIER, College Station, Tex., discussed the effect of louver dimensions on performance, and pointed out that the data presented by the author evidently could not be applied to slats having different dimensions, spacings, and shapes.

Following the presentation of this final paper, Chairman Mart turned the meeting over to President Taylor who announced the personnel of the Resolutions Committee as follows: B. L. Evans, St. Louis, Mo., C. B. Gamble, New Orleans, La., and F. H. Faust, Bloomfield, N. J. The session was adjourned at 11:50 a.m.

SECOND SESSION, TUESDAY JANUARY 26, 9:30 A.M.

First Vice Pres. L. N. Hunter, Johnstown, Pa., called the meeting to order in the Ballroom of the Rice Hotel, and requested R. S. Dill, chairman, Committee on Research, to present his report (to be published in April ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*). This report included also a report of the Acting Director of Research, C. M. Humphreys, Cleveland, Ohio, and a report by G. V. Parmelee, Cleveland, Ohio, on his visit to the Republic of Israel. The services of Mr. Parmelee had been requested by the United Nations.

HOT CLIMATE PROBLEMS OF ISRAEL

The Officers, Council and members of the Committee on Research of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS were especially proud that the United Nations requested the loan of a Society research staff member to aid in bringing human comfort conditioning to a new nation. The UN Technical Assistance Board, which screens requests for technical aid from member countries, invited G. V. Parmelee, research associate, ASHVE Laboratory, to accept a short-time appointment as technical advisor to the Meteorological Service of Israel. The Society granted Mr. Parmelee leave of absence, and he spent August and September, 1953, assisting in the siting, orientation, and design of buildings, also in the best use of building materials and insulation for maximum human comfort.

Mr. Parmelee reported that he gave most of his aid through seminar sessions on heat transfer, air flow, instrumentation and physiology, and their application to indoor climate problems. This work was supplemented by lectures to groups responsible for housing construction in various parts of the country. Instruction was given in use of instruments for indoor climate research, and he demonstrated the setup of instruments. In addition, discussions were held with important individuals and various small groups.

Visits were made to more difficult areas of Israel, such as the Negev desert region, and the Jordan Valley, to conduct a survey of indoor climate conditions. Information obtained through this survey largely guided the seminar course, and formed the basis for experimentation.

Israel's principal climatic problem is to provide suitable indoor living conditions during the summer evening hours. The majority of the people in the most severe areas work long, hard hours in the hot fields. In order to meet the country's food needs, these workers must have enough relief from the climate to obtain sufficient sleep and rest. Consequently, experiments in comfort conditioning were centered on small homes.

Israeli dwelling structures, he said, are mainly masonry, which gives good protection from the climate by day. By late afternoon or evening, however, transfer of heat stored in the walls, to the indoors, makes home occupancy almost intolerable. Lack of money to purchase and install sufficient air conditioning equipment dictated the use of simple and inexpensive measures.

Mr. Parmelee presented a compilation of climatic data for selected regions of Israel, Table 1. Deductions reached from study of these data are that Israel's climate has much in common with many parts of the United States, the southwest in particular. Hot summer days in New York, Cleveland, and Chicago, except for frequency of occurrence and degree of relative humidity, are not unlike those in Tel Aviv, he reported.

Investigations of the Meteorological Service and the Research Council of Israel on thermal behavior of buildings of different construction, the influence of building orientation on ventilation and the resultant indoor climate, have pointed ways to obtain results with simple instrumentation. Building construction types were thoroughly studied, the conclusion being that building materials did not play too important a part in indoor climate.

Methods taken to obtain immediate comfort conditioning were: whitewashing the red tile roofs; providing shade for walls and roof; utilization of thermal ventilation during the no-wind periods; more advantageous use of building materials; awnings and vertical shutters for windows and balconies, and during the day, when winds are available, providing cross ventilation.

The primary need, he stated, is a supply of attic fans and the electricity to operate them. Attic cooling would lessen considerably the humid atmosphere in Israel dwellings. Systems of evaporative cooling would be effective in many areas. Trial installations of several systems have been recommended for study of minimum needs.

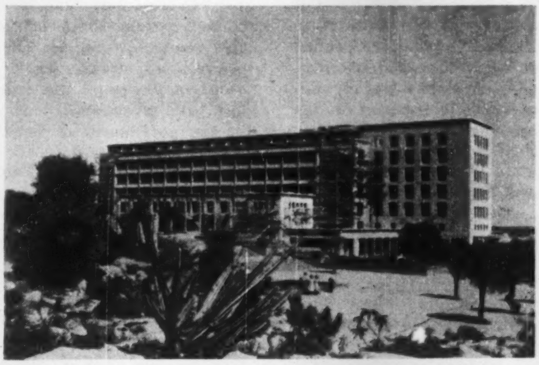

Fig. 1—Hotel in Tel Aviv oriented east-west showing verandas shading south side

JOURNAL SECTION

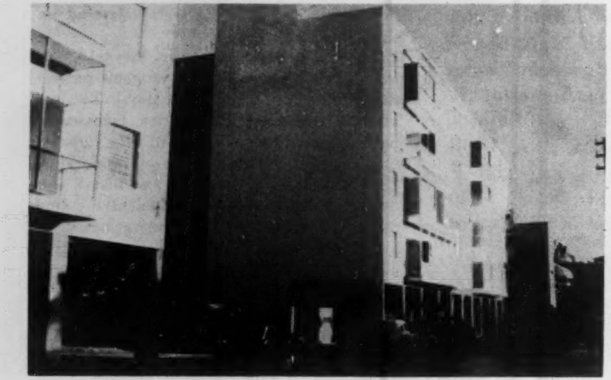

Fig. 2—Apartment building in Israel

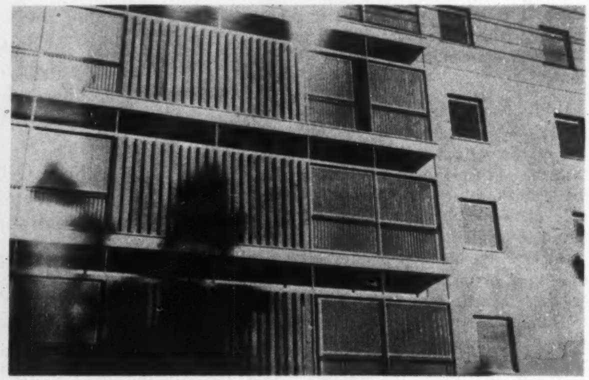

Fig. 3—Close-up of balconies on building of Fig. 2 showing shading with vertical shutters

Attention is being given building orientation to obtain maximum benefit of the wind and minimum effects from the sun. Fig. 1 shows a large hotel in Tel Aviv, oriented east-west, and with deep verandas shading the south side. A new 400-bed hospital on the outskirts of the city is similarly designed to reject sun rays from patients' rooms along the south exposure. Although not so well oriented, the apartment building in Figs. 2 and 3, has its balconies well shaded with vertical shutters. He described the sleeping quarters of a village in Negev south of Beersheba, having the type of sun protection afforded small buildings.

In conclusion, Mr. Parmelee gave a summary of his observations as follows:

Fan systems would probably provide proper conditions in the majority of difficult areas. Power lines to provide operating source for this system would cost less to install than for water cooling equipment.

An irrigation system is essential to develop the rich loam of the Negev and Jordan Valley into a food producing region important enough to make the country self sufficient with respect to food. Any piping system capable of supplying an adequate water supply for irrigation, could be used for the supply source of cooling tower installations in larger buildings.

Problems of Israel in indoor comfort conditioning are not unique, but are common to a large part of the world. Research subsequent to establishment of this conclusion reveals that relatively little has been accomplished in adapting housing to hot climates.

Relatively little is being done in this country to show how housing can be better adapted to hot climates. A great deal has been written and said about what measures should be taken (see BRAB Proceedings on Housing and Building in Hot-Humid and Hot-Dry Climates). However, there is an astonishing lack of factual data to prove or disprove the merits of various schemes and designs.

The most noteworthy accomplishments in this field in this country are the researches of the University of Texas and those of Texas A. and M., respectively, on thermal performance of all-ceramic houses and on natural ventilation.

Analyzation of the complete thermal system to learn optimum design layouts that properly blend thermal capacity, sun protection and natural ventilation are projects vital to improvement of indoor climate conditioning.

This field is a logical application of thermal circuit principles and has only been scratched. Noteworthy is the recent work of the Australian Commonwealth Building Research Station, which, Mr. Parmelee believes, is not being continued because of lack of funds. The ASHVE is now exploring ways and means of solving thermal system problems and has now made some contributions. This work should receive much stronger emphasis.

On completion of the assignment, a report with recommendations was prepared for the government of Israel, which may restrict the circulation of the report to its own people or may allow unrestricted publication. It was thought by Mr. Parmelee that it may be published by the United Nations.

Table 1—Climatic Data for Selected Regions in Israel[a] — Average Values for June, July, August and September

Region	Station	Dry Bulb, Deg F		Ave. R. H. at 2 p.m. Percent	Wet Bulb deg F	Dew Point deg F	Clouds in Tenths
		Ave. Max.	Maximum of Record				
Jordan Valley	Beit Shean	96	120	38	75	66	1
Central Negev	Beersheba	91	115	39	72	62	1
South Negev	Eilat	101	—	24	72	58	1
Coastal Plain	Tel Aviv	84	116	65	75	72	2
Hill Region	Jerusalem	84	112	44	68	60	1

[a] From "Climatological Normals" (Series A Meteorological Notes No. 3, Meteorological Service of Israel, Jerusalem 1952).

First Vice President Hunter called upon P. B. Gordon, New York, N. Y., to act as chairman of the Second Technical Session. Mr. Gordon introduced G. V. Parmelee, who presented the paper, Circuit Analysis Applied to Load Estimating, by H. B. Nottage, Santa Monica, Calif., and G. V. Parmelee (complete paper and discussions to be published in the ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*).

The second technical paper, Heat Flow Characteristics of Hot Water Floor Panels, by E. L. Sartain and W. S. Harris, Urbana, Ill. (published in ASHVE JOURNAL SECTION, *Heating, Piping & Air Conditioning*, January 1954) was presented by Mr. Sartain.

P. R. ACHENBACH, Washington, D.C., suggested that the vertical heat flow meters might not provide an accurate measure of heat flow when placed near the end of the floor slab because the heat flow within the slab in this location would not be exactly perpendicular to the meters. Considerable judgment would therefore be required in assigning the proper area to the heat path and the proper correction to the observed temperature differences.

Referring to Table 3, it was noted that the panel output computed from the heat flow meters was in relatively good agreement with the output computed from electric meter readings. Mr. Achenbach inquired whether such agreement could usually be expected. This agreement was better at the higher outdoor temperatures than at lower outdoor temperatures. The difference might be due to lag in the cooling of the earth under the slab. It is probable that the entire system was nearer to steady state conditions during mild weather than it was during cold periods which, however, would not last long.

Referring to Fig. 7, Mr. Achenbach stated that it would not be expected that nearly twice as much heat could be transferred from the upper floor surface near the cold wall as was transferred at the center of the room at a uniform flow temperature unless there was a greater temperature difference between the embedded pipe and the floor surface near the edge. The desirability of having the hot water enter the panel near the cold walls is therefore evident.

For the conditions shown in Table 7, it was felt that the effect of radiation would be greater than indicated when the baffle between the window and the heat meters provided clearance between the floor and the baffle. Under this condition, the downflow of cold air from the window and behind the baffle would cause a current of cold air to flow along the floor, and hence increase the proportion of heat transfer due to convection.

The use of 1-in. insulation was questioned, since previous investigations would indicate that 2-in. insulation should be used with heated floor slabs.

R. S. Dill, Washington, D.C., asked the authors whether the ground was wetted by rain or snow during the test, and if so, what effect the dampness would have on the heat transfer.

P. E. McNall, Jr., Minneapolis, Minn., remarked that while the heat flow from the edge of the panel near the outside wall and windows increased, the floor surface temperature did not show any increase. He felt that the floor surface temperature should have been increased to compensate for the effect of the cold outside wall when considering the comfort of an occupant.

R. G. Vanderweil, Boston, Mass., noted in Fig. 4 that there was heat output from the panels even though no heat was being supplied to the panels. This would indicate an unsteady heat flow condition due probably to inertia of the ground. He inquired whether the authors had attempted by means of the thermocouples buried in the ground under the slab to determine the possible heat flow from the ground to the panel. Pointing out that the reverse heat loss from the panels with edge insulation amounted to 20 to 23 percent of the total panel output, Mr. Vanderweil emphasized that the loss would be considerably greater if the soil had been moist due to ground water near the surface or water flowing through the soil.

P. B. Gordon noted that as shown in Table 4, the measured heat output of the panel is generally less than the calculated heat output. It seemed probable, therefore, that the projections of the curves to the 80 deg temperature differential in Fig. 5 should have been curved upward instead of being continued as straight lines.

Authors' Closure — Professor Harris stated that he would comment on some of the questions which had been raised. It was admitted that the error of measurement was probably greater with regard to edge loss than at any other point in the slab. Fortunately, the total loss through the edge of the slab was a very small portion of the total heat flow, and consequently errors in the measurement of the edge heat loss did not have a great effect on the overall results of the tests.

With regard to the effect of the baffle placed between window and heat meter, it was found that the baffle, if raised to provide clearance at the floor, increased the total output. The actual proportions of radiation and convection as given were not considered to be exact.

The authors would have preferred 2 in. of insulation under the slab, but decided to run the tests without changing the 1-in. insulation which had been installed.

In reply to Mr. Dill, Professor Harris stated that during part of the time there was either rain or snow, but that no measurement of the effect had been made. It was obvious, however, that moisture in the soil would increase the reverse heat loss to a very great extent.

Referring to Mr. McNall's comment, Professor Harris agreed that it would be good practice to increase the heat output of the panel near points at which the heat loss would be high. Such increase near cold walls and windows would create convection currents which would tend to prevent cool downdrafts from the surfaces.

Tests are being continued for determination of the heat loss into the ground. Data will be obtained on the storage of heat in the ground during severe weather and its return to the panel in mild weather.

The soil temperature within the first 2 or 3 ft under the floor did not vary more than 5 or 6 deg during the winter.

With reference to Mr. Gordon's question on the validity of extending the curves of Fig. 4, Professor Harris stated that since temperatures of −10 F were rare in Urbana it was not possible to obtain a test under these extreme conditions. Previous work at the University of Illinois seemed to indicate that it would be proper to extend the curves as straight lines.

The third technical paper, Effects of Non-Uniformity and Furnishings on Panel Heating Performance, by L. F. Schutrum and C. M. Humphreys, Cleveland, Ohio, (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning,* February 1954) was presented by Mr. Schutrum.

W. P. Chapman, Pittsburgh, Pa., pointed out that there was a decrease in panel output for various amounts of furnishings, and at the same time an increase in air temperature. This would indicate that by putting enough furniture in the room there would be no output from the panel and the room would be very hot. This condition could not be obtained, and the explanation is that the panel output is decreased by the presence of furnishings, but the air temperature is increased by furnishings. In other words, if the same air temperature is to be obtained, the required panel output will be reduced. He also inquired whether the heat meters close to the long cold wall showed an increased output due to down-drafts from the wall as compared to the average output of the panel.

R. J. Mindak, Chicago, Ill., pointed out that using a simple theory for radiation output, and taking into account the location of the panels near the cold surfaces, it would be expected that the output of these panels would be increased.

He also mentioned that the furnishings had the effect of reducing the height of the room. It might be possible, therefore, if the height were decreased in the unfurnished room to the equivalent height from the top of furnishings to the ceiling (in the furnished room) that the output would be the same as obtained for the room with the furnishings. Mr. Mindak reported making tests in a non-uniform environment having one long cold wall. The results obtained were in good agreement with the uniform output measurements reported in a previous ASHVE paper, Heat Exchanges in a Floor Panel Heated Room, by L. F. Schutrum, C. M. Humphreys and G. V. Parmelee.

John Everetts, Jr., Philadelphia, Pa., inquired whether the authors had any data on the increase of downward heat loss to the ground or to a crawl space when the floor panel was covered with a carpet.

P. R. Achenbach, Washington, D.C., inquired whether Fig. 5 indicated that the ceiling was considerably colder than the air, and that most of the heat emitted by the floor was withdrawn from the space by the ceiling. If so, it appeared that a comparison was being made between a room having one or more cold walls producing convection and one having a uniform environment in which a distributed cold ceiling was producing convection currents over a distributed area. Since the furniture caused less heat output from the panel, and consequently less heat loss from the room, it would be of interest to know whether this indicated that a space in which the radiation is prevented from reaching cold surfaces would have less heat loss than a room without furnishings. He also remarked that there is considerable discussion about whether a panel-heated space loses more or less heat than a space heated by convection.

E. L. Sartain, Urbana, Ill., referred to Mr. Everett's question, and pointed out that in tests at the University of Illinois, heavy-weight carpet with a heavy-weight pad at design conditions increased the fuel consumption about 40 percent. Over the entire range of outdoor temperatures, however, it is found that some of the heat flows to the room from the panel, thus causing a reduction in the energy supplied.

In the authors' closure, Mr. Humphreys confirmed previous statements of discussers that there was definitely a greater heat exchange along the cold walls. It had been found in tests at the Laboratory that a good heat balance could not be computed until the number of heat meters along the cold walls had been increased beyond the number used in the first tests. Mr. Humphreys pointed out that Mr. Everett's question had been answered by Mr. Sartain.

It was not possible to give a direct answer to several of the questions proposed by Mr. Achenbach. It was, however, evident in the tests that shielding of the cold surfaces from the heated panel would always decrease the heat loss from the room.

As tests were continued in the test room, it had been possible to develop methods of obtaining closer measurements and making closer corrections of the measurements.

The fourth technical paper, Field Studies of Floor Panel Control Systems, Part II, by A. B. Algren, E. F. Snyder, Jr., and R. R. Head, Minneapolis, Minn., was presented by Mr. Snyder (complete paper and discussions to be published in the ASHVE Journal Section, *Heating, Piping & Air Conditioning*).

Mr. Gordon turned the meeting over to First Vice President Hunter, who called for a report of the Tellers of Election. This report was given by S. W. Beaty, Shreveport, La.

Report of Tellers of Election

Ballot for Officers	Total
President	
L. N. Hunter, Johnstown, Pa.	1777
First Vice President	
John E. Haines, Minneapolis, Minn.	1667
Second Vice President	
John W. James, Chicago, Ill.	1772
Treasurer	
E. R. Queer, State College, Pa.	1770
Members of Council (*three-year term*)	
J. H. Fox, Toronto, Ont.	1759
A. J. Hess, Los Angeles, Calif.	1755
C. H. Pesterfield, E. Lansing, Mich.	1751
B. H. Spurlock, Jr., Boulder, Colo.	1745
Committee on Research (*three-year term*)	
W. F. Friend, New York, N.Y.	1757
John Everetts, Jr., Philadelphia, Pa.	1758
C. F. Kayan, New York, N. Y.	1756
H. R. Limbacher, Kalamazoo, Mich.	1755
E. F. Snyder, Jr., Minneapolis, Minn.	1758
Total Ballots Received	1955
Total Legal Ballots	1779
Invalid Ballots	176
Total Write-Ins	14

Respectfully submitted,
S. W. Beaty, *Chairman*
A. B. Ullrich, Jr.
R. E. Haubold

The second session was adjourned at 12:30 p.m.

THIRD SESSION, WEDNESDAY, JANUARY 27, 9:30 A.M.

Second Vice Pres. John E. Haines, Minneapolis, Minn., called the meeting to order in the Ballroom of the Rice Hotel and introduced Prof. B. H. Jennings, Evanston, Ill., to conduct the technical session.

The first technical paper, Costs of Operating the Heat Pump in the Equitable Building, by J. D. Kroeker and R. C. Chewning, Portland, Ore. (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, November 1953) was presented by Mr. Kroeker.

E. H. Hattersley, Fort Wayne, Ind., noted that in the installation discussed, both heating and cooling were taken care of by means of circulated air in order that partitions could be arranged or moved as desired without affecting the operation of the system. He inquired whether it might be advisable to use the heat pump, in factory or industrial buildings, in combination with a circulating hot water system with convectors or baseboard radiation, so that the air would only be used as an auxiliary means of summer cooling.

E. R. Lokey, Portland, Ore., expressed interest in the cost of the survey and the source of money for deferring the cost.

H. E. Ziel, Detroit, Mich., asked whether the rate of air change was the same in the heating cycle as in the cooling cycle.

R. G. Vanderweil, Boston, Mass., stated that the various papers on the heat pump which had been prepared by Mr. Kroeker had been found very helpful in a general study of the heat pump. He requested further information about the cost of power in Portland, Ore., with regard to demand charge and hourly rate. He noted that in Table 5 none of the cost for refrigeration used in cooling was charged to heating, and suggested that it might have been proper to charge 50 percent of this cost to heating and 50 percent to cooling.

Authors' Closure — Mr. Kroeker referred Mr. Hattersley to the description of the installation in the Oregonian Publishing Company's Building found in a paper published in 1951, entitled, Heat Pump Application to a Newspaper Plant, by J. Donald Kroeker, J. H. Bonebrake and J. A. Melvin. In this installation a split system using warm water panels was used. The heat pump could be used to advantage in many combinations of systems because its principal purpose is to conserve heat which would normally be wasted.

In response to Mr. Lokey's question, Mr. Kroeker stated that the cost of obtaining the information and preparing the paper was 5½ times the cost of energy for the Equitable Building for one year.

In answer to Mr. Ziel, it was stated that the quantity of air circulated in summer was the same as in winter. The ability to use the same quantity in both cases was due largely to being able to design draftless air flow from the outlets.

Referring to Mr. Vanderweil's questions, Mr. Kroeker pointed out that the distribution of charges would depend upon the type of analysis desired. In the case of the building described the important consideration to the owner was cooling. The distribution of charges was therefore made with emphasis on the cost of cooling.

The subject, Availability and Utilization of Solar Energy, was prepared in the three following parts by R. C. Jordan and J. L. Threlkeld, Minneapolis, Minn.:

Solar Energy Availability for Heating in the United States (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, December 1953);

Utilization of Solar Energy for House Heating (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, January 1954);

Design and Economics of Solar Energy Heat Pump Systems (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, February 1954).

M. L. Ghai, West Hartford, Conn. (Written): The lack of data on the availability of solar energy is a serious handicap in estimating the economics and engineering feasibility of the utilization of solar energy for various purposes. It is of special importance in heating of buildings and other applications where the energy is required at comparatively low temperature level. These applications are presumed to be nearly competitive for several localities, although it is difficult to estimate precisely their economics due to lack of information required for engineering design. The authors have made an admirable approach toward analyzing the scanty information available.

The paper seems to indicate a very interesting and fortunate fact. Throughout the United States, January is generally considered the worst month as far as heating is concerned. That the month of January is almost always colder than December is indicated by the table of degree days given in The Guide for about 230 stations in the United States, Canada and Newfoundland; the degree days for December are never more than the degree days for January. Table 6 indicates that in all cases presented in the table, the worst month for the availability of solar energy is December, not January. The same trend is indicated by Table 4 giving average sunshine hours. If this trend is generally true, it is fortunate that the availability of the solar energy is comparatively favorable in the month of January when the heating load is maximum. Apparently the cold weather generally lags behind the minima of the received solar energy.

Table 10 compares the degree days and the solar energy received for the stations of Table 6 for which the number of degree days were available in The Guide. For all cases, the trend for degree days and the solar energy received in January is more than for December. The ratio of average monthly solar radiation to degree days is generally less for December than for January, although, in some cases it is almost the same. December would thus appear to be a more critical month for heating with solar energy even though the heat load is maximum in January.

Another point of particular importance is the observation of the authors, stated in the last paragraph of the paper, that very cold days normally have above-average radiation, and the days with less than threshold radiation are often days having less than the average heating requirement. This would tend to even out the variations in the daily supply and demand of the heating energy.

Whereas, Figs. 12 and 13 should prove very useful for engineering designs, a word of caution might be in order. These figures are based on total solar radiation which includes the direct specular radiation, and the indirect diffused or the sky radiation. Most types of solar heat collectors respond very favorably to the direct radiation but their efficiency for collecting sky radiation is very poor. Solar collectors often use plates of ordinary window glass which has excellent properties of trapping solar energy due to its high transmissivity for short wave solar radiations and low transmissivity for the long wave radiations emitted from the inside surfaces of the collector itself. It thus lets in the solar radiations but does not allow the heat rays to be transmitted outside. Since the diffused radiation is of longer wave length, the glass which is suited for direct solar radiation is poor for the diffused radiation. Furthermore, the transmissivity of glass is best for normal rays only. It is less for other angles of incidence and is very poor for angles of incidence less than the critical angle. The diffused radiations coming at all different angles of incidence are therefore not transmitted properly. Solar collectors which use focussing metallic reflectors, or even straight metallic reflectors, are worse than collectors using glass. They do not collect any appreciable quantity of diffused sky radiations. It is therefore desirable to treat the direct and diffused radiations separately, or alternatively, as a safe practice, not to rely upon the diffused radiation. However, due to the lack of existing data on diffused radiation, it is doubted if it is possible to draw reliable curves, as in Figs. 12 and 13, for the direct and diffused radiation separately, or even to have approximate integrated values of diffused radiations for different localities.

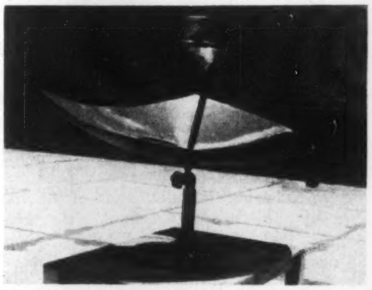

Fig. A-1—A device for collecting and utilizing solar energy for cooking

An interesting influence of the diffused radiation was observed during the development of a solar cooker at the National Physical Laboratory at New Delhi, India. It was found that the solar cooker sometimes gave better performance on cold winter days, in spite of larger heat losses from the exposed surface of the cooking utensil, than on warm summer days with a greater amount of total solar radiation. During the summers in New Delhi, the general dust content of the air is greatly increased on account of the frequent wind storms coming from a neighboring desert. The high dust content increases the percentage of diffused radiation even though the solar altitudes are more favorable in summer than in winter. The reflector of the solar cooker did not collect the diffused radiation, and consequently performance was reduced. It was found necessary to rely upon the direct solar radiation instead of the total radiation. The development of the solar cooker, shown in Fig. A-1, has been covered in a series of papers published in the *Journal of Scientific & Industrial Research*, New Delhi.

With the increasing popularity of year 'round air conditioning in the United States, as indicated by the record sales of air conditioning equipment and still higher sales predicted for the coming years, the study of the use of solar energy for the heat pump is very timely and will probably show a way toward overcoming some of the well known limitations of the heat pump.

It may also be worthwhile to extend the studies to systems combining the use of the heat pump with direct heating with solar energy. For the normal winter weather conditions, an inexpensive direct solar heating system may suffice, whereas, during the extreme weather conditions, the air conditioning unit run as a heat pump could supplement the heat supply. Such a system would reduce the heavy heat storage requirement which tends to make heating with solar energy alone uneconomical. With the exception of peak load conditions, such a system would still supply heat with no recurring fuel expenses. Considering both the initial capital investment and the recurring expenses, it might give year 'round air conditioning at a most favorable cost.

R. W. McKinley, Pittsburgh, Pa. (Written): The authors' purpose is clear and important. The information presented is interesting and useful. It is more immediately useful, I believe, than one might assume from a simple consideration of its potential value in solar house design and similar developmental problems related to the depletion of our fossil fuel reserves.

I hope that I can interest the authors in adding similar data for the spring, fall and summer months and for north, east and west elevations. The year 'round data will be of immediate value in current heating, ventilating and air conditioning design. Because of their familiarity with the U. S. Weather Bureau records, I would like to ask that they analyze and comment also on Weather Bureau wind records and their bearing on natural ventilation design. I feel that in many areas, unwarranted reliance is placed by designers

Table 10—Comparison of Average Monthly Degree Days, and Average Monthly Total Solar Radiation Received by a Horizontal Surface in Langley's per Month for December and January

Station	December			January		
	Total Solar Radiation	Degree Days	Solar Radiation per Degree Day	Total Solar Radiation	Degree Days	Solar Radiation per Degree Day
Chicago, Ill.	2697	1116	2.4	4743	1218	3.9
Fresno, Calif.	4898	562	8.7	6642	573	11.6
Ithaca, N.Y.	3193	1129	2.8	3596	1236	3.9
Lincoln, Neb.	5146	1144	4.5	5797	1242	4.7
Madison, Wis.	3689	1296	2.9	4619	1451	3.2
Nashville, Tenn.	4092	748	5.5	4278	788	5.4
New Orleans, La.	6200	304	20.4	6665	323	20.7
New York, N.Y.	3689	940	3.9	3999	1028	3.9
Washington, D.C.	4929	872	5.7	5053	928	5.4

on natural ventilation as a means of dissipating unwanted solar heat gain during mild and hot weather. This is becoming increasingly apparent in schools and offices with large areas of side-wall windows and skylights. The authors could help to improve this situation by making a simplified summary of related design conditions readily available.

Because electric lighting systems introduce useful quantities of thermal energy and are needed most at night and on the very dark, overcast days when solar energy is not available, it would be interesting to consider the heating capacity of typical electric lighting systems designed to produce 10, 20, 40 and 80 ft-candle illumination levels. Similarly, in mild weather it is possible that a photoelectric control in the electric lighting system would justify its cost by insuring that the added cooling load of the electric lighting system would not be imposed on a cooling system on the bright, clear days when the fenestration system is sure to provide adequate daylight illumination. A very interesting study along this line is being made by Torrence MacDonald of the U. S. Weather Bureau who has determined that their total solar energy data in langleys can be converted to daylight foot-candles by applying a multiplying factor approximately equal to 7000.

G. V. Parmelee, Cleveland, Ohio, referred to Mr. Ghai's comment regarding the poor performance of solar heating collectors for diffused radiation and stated that diffuse radiation is short wave radiation to which glass is reasonably transparent. Mr. Parmelee also pointed out that the principle of thermal circuits and circuit analysis being developed in the Society could be used to advantage in analyzing the complex thermal system consisting of a combination of a solar collector, a storage unit, and the building.

A. B. Newton, Wichita, Kan., suggested that the study be carried on to show the possible effect that thermal storage might have in saving our natural resources.

R. G. Vanderweil, Boston, Mass., remarked that he had visited a house near Boston which had operated for 3 or 4 years using a solar heat collector similar to one of the types shown by the authors. It is reported that this installation has been able to operate without the use of auxiliary heat.

C. M. Ashley, Syracuse, N.Y., inquired whether the cooling load calculation as used by the authors was based upon a 24-hour design value or upon instantaneous design load. There is a present trend toward use of the 24-hour design basis. He also asked whether, in cases where the heating requirements exceed the cooling requirements, it would be possible to deliver a portion of the solar heat gain to the high pressure side of the system even though at a less efficient rate in order to be able to utilize all of the solar energy that could be absorbed.

B. P. Fisher, Houston, Tex., suggested that the type of research discussed by the authors was so important that members as well as industry should contribute money to enable the research work to continue.

Dr. Jordan in his author's closure stated that much correspondence has been received following the publication of the first two of the papers presented. He mentioned that Dr. Austin Whillier, Cambridge, Mass., had shown that the ratios in Fig. 5, for spring and fall, and particularly in summer, should be even greater than indicated. However, the correction is small so that it would have practically no effect on the calculations or conclusions in the paper. If, however, Fig. 5 were used with reference to higher temperature collectors, then the correction pointed out by Dr. Whillier would be important because the collector efficiency decreases (due to greater heat loss to the ambient air) as the difference in temperature between the ambient temperature and the collector temperature increases.

In answer to Mr. Newton, Dr. Gordon said that up to the present time it had not been possible to study the effect on conservation of natural resources.

Dr. Jordan concluded by stating that the instantaneous cooling load method of calculation had been used but that Mr. Ashley's suggestion brought up another point which should be investigated.

The last technical paper, Effects of Air Conditioning on Plant Growth, by F. W. Went, Pasadena, Calif., was presented by the author (complete paper and discussions to be published in the ASHVE Journal Section, *Heating, Piping & Air Conditioning*).

At the close of the technical session, Mr. Gordon turned the meeting over to Second Vice President Haines who adjourned the third technical session at 12:15 p.m.

FOURTH SESSION, WEDNESDAY, JANUARY 27, 2:00 P.M.

Pres. Reg. F. Taylor called the meeting to order in the Ballroom of the Rice Hotel, and introduced W. A. Grant, Syracuse, N.Y., as chairman of the technical session.

Mr. Grant expressed his pleasure in finding that all of the papers for the session had been prepared by younger members of the Society. He called on H. E. Straub, Urbana, Ill., to present the first technical paper, Room Air Distribution Research for Year 'Round Air Conditioning — Part II, Supply Outlets at Three Floor Locations, by H. E. Straub and S. F. Gilman, (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, November 1953).

E. R. Ambrose, New York, N. Y. (Written): The authors and their associates are to be congratulated for devoting the necessary time and effort to present the data and results in such a useful and informative manner. It is gratifying to know that the project will be continued with an examination of baseboard slot-type outlet and low sidewall diffusers.

The effect of the return location on the air distribution was not mentioned in the paper. In the previous article on the subject, however, a gentle flow towards the return, below the 4-in. level, was observed but it was stated that the two tests were not sufficient to warrant a definite conclusion. Were any additional observations made or is any further work planned on the location of the return?

The effect of the grille aspect ratio on the air distribution was not specifically mentioned. Were there any indications that a high aspect ratio (of say 4 to 5 or more) would improve the circulation of a high sidewall outlet? The natural tendency would be to locate two smaller high sidewall grilles on the inside south wall instead of one larger outlet on the west wall in order to shorten the throw as well as to improve the possibility of a better coverage. Is it planned to investigate other sidewall locations as well as to explore the use of ceiling outlets and the special sidewall outlets now on the market?

All of the data in the paper were taken in a room bare of furniture and with continuous fan operation. Would the results be changed materially with conventional furnishings using intermittent fan operation?

It was concluded in the paper that the floor outlet, located at the center of an exposed wall, would provide the best distribution for year 'round air conditioning but a location adjacent to an inside wall (south wall in the tests) might also be satisfactory. Is it the intent in future tests to explore the possibility of locating both the supply and return openings in, or adjacent to, an inside wall for the purpose of materially lowering the first cost of the system?

It is realized that, in a project of this nature, there is a practical limit to the various possibilities which can be investigated. It is hoped that the authors can give some answers to the questions based on their observations to date.

W. O. Huebner, New York, N. Y. (Written): The warm air heating system plays an important role among the various heating systems used in the private homes of this country. One advantage is that it may readily be adapted to serve for cooling as well as for heating.

With cooling added to heating the necessity for good air distribution in homes is obvious. The investigations at the University of Illinois are, therefore, of great interest to all concerned with the air conditioning of homes.

An entirely practical approach is used in the investigations — similar to the approach used by the manufacturers of air distribution devices — and consists in simulating actual conditions in a room as closely as possible. The basic studies of free ventilating jets made at the ASHVE Research Laboratory and at Case Institute of Technology in Cleveland are thus happily complemented.

The University of Illinois' program has already yielded valuable contributions to the solution of practical air distribution problems in residences, and this paper adds to our knowledge. Its careful study is most rewarding, and the methods used by the authors in tabulating their measurements might well serve as a guide to others. I refer particularly to the method used in indicating by letters the type of test made, thus easily identifying a particular investigation and making it easy to compare different tests. The analysis of the tests, as well as the whole representation, is to be commended.

Some of the results obtained, particularly those regarding the good performance of floor outlets, are of special interest. The shortcomings of floor outlets are, of course, well-known and the question whether or not it is advisable to install them in homes may be debated at length.

Generally, the results of the authors confirm the findings of the air distribution specialist. The superior performance of diffusers is noted and confirms the experience that an air distribution device, in order to perform satisfactorily, must readily entrain a large amount of room air, and create an unceasing air movement in the room without permitting stagnation of the air.

As an engineer having particular interest in air distribution progress, I should like to add the following remarks:

Investigators in air distribution research should make more use of each other's findings. It would be of great interest, for example, to see the formulas developed by Prof. G. L. Tuve and his associates of Case Institute of Technology applied to the research of the University of Illinois. These formulas, thanks to G. E. McElroy, Pittsburgh, Pa., will appear in chart form in The Guide, 1954.

The members of the Society should take enough interest in these problems to help the Society continue air distribution research at its Research Laboratory. I am happy to add that Prof. Alfred Koestel at Case Institute of Technology is continuing his investigations.

This is a valuable paper, and a fine contribution to the work of the Society.

C. M. Ashley, Syracuse, N. Y., noted that in this study even with the best arrangement there still was a very substantial temperature stratification between the floor and breathing levels. This would indicate the need for either a blanketing of the walls and windows with a stream of warm air to prevent the cold drafts of air from reaching the floor, or some means should be provided for withdrawing the air from the floor and mixing it with the supply air. An investigation of these methods was suggested for future study.

It was also suggested that a study be made of the effect of placing the supply outlets under the windows.

Mr. Ashley referred to the authors' comment that storm sashes installed on the windows obtained only slight improvement in the air distribution. He felt that if the effect of mean radiant temperature were taken into account there would be a considerable difference between the results obtained with single as compared with double sash windows. Mr. Ashley reported that he had found crawl space useful to prevent low floor temperature and also as a means of introducing heat below the floor to make the floor into a heated panel.

In the authors' closure, Mr. Straub stated that much of the work suggested by Mr. Ambrose was already in the plan for future tests which will include work on baseboard type outlets with vertical and horizontal slots, also sidewall diffusers, high sidewall outlets on outside and inside locations, and multiple outlets on inside walls. Studies with ceiling outlets were also contemplated.

Outlets located under windows as suggested by Mr. Ashley would also be tested in future studies and additional work is planned on the effect of the return air grille location.

In the tests conducted, the aspect ratio was about 1.8 to 2.9 for high sidewall studies and varied from about 1 to 7 for floor outlets. These aspect ratios covered the range found in residential type outlets. The charts and curves in this report however, do not show the separate effect of the aspect ratio.

Present tests were not made with furniture in the room. Furniture would undoubtedly provide a disturbance of air current. If investigators moved in the room when conducting tests, it was found that the air circulation pattern was disturbed for a few seconds but that it quickly returned to its original form.

The steady-state conditions were obtained in the tests during intermittent operation of the fan. An isothermal condition was approached near the end of the cycle and at that time the supply air temperature was relatively low. When this occurred, air of lower temperature was mixed with the room air resulting in lower temperature near the ceiling when the fan was stopped. The test data therefore, would probably show higher temperature variations than would normally be found in a residence.

The second technical paper, Cooling a Small Residence Using a Perimeter-Loop Duct System, by D. R. Bahnfleth, C. F. Chen and H. T. Gilkey, (published in ASHVE Journal Section, *Heating, Piping & Air Conditioning*, February 1954) was presented by Mr. Bahnfleth.

S. F. Gilman, Syracuse, N. Y., stated that from Fig. 4 it was evident that insulation would be desirable in the east and west walls of the test rooms. The agreement between the calculated and measured heat flows for the east wall and for the ceiling seemed to be satisfactory, but correlation was not so good for the south wall, due probably to the authors' assumption that the south wall received direct solar radiation even though it was protected by roof overhang. He inquired whether the maximum heat flow would be closer to the measured maximum if the south wall were assumed to be completely shaded.

Mr. Gilman pointed out that if the calculated and measured heat flows for walls and roof could be brought into agreement, the test rooms and equipment might be used to yield an important method of calculating glass heat gains.

It was also suggested that the thermal circuit analysis method being developed by the ASHVE Laboratory could be applied to one of the test rooms at the University of Illinois so that circuit technique results could be compared with actual operating results.

It was noted that the floor registers provided satisfactory air distribution, thereby indicating an advantage of a panel convection type of system. In this system the supply air temperature rises as it passes through the ducts, and consequently the differential between the supply and room air temperatures is at an average of about 10 deg rather than the usual 15 or 20 deg obtained in non-panel systems.

Mr. Gilman asked about the magnitude of the outlet air velocities, and whether the authors plan to utilize flow diffusers rather than flow registers in future studies.

Lester T. Avery, Cleveland, Ohio, asked what method was used to reduce the refrigerating machinery capacity for the purpose of eliminating frequent cycling.

Since cooling systems are actually being operated at about 75 F room temperature rather than 80 F, it was of interest to know what the actual inlet air temperature was in the tests.

Mr. Avery cited one instance in which an office having plate glass windows exposed to the south and west, and equipped with venetian blinds, was heated by a perimeter system. It had been found that this same system also operated satisfacto-

JOURNAL SECTION

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

F. Paul Anderson Medal presented to Walter L. Fleisher at the Banquet of the 60th Annual Meeting in Houston, by Pres. Reg. F. Taylor

rily when the same ducts and air distribution system were used for cooling.

P. R. ACHENBACH, Washington, D.C., pointed out that when the compressor was run at half capacity, the desired 50 percent relative humidity was not maintained even though it would be expected that from the continuous operation of the compressor better humidity conditions would be obtained than with intermittent operation.

He also stated that the sensible heat ratio would probably be lower than that found during these tests if there had been occupants in the house or if more ventilation had been used. The computed allowance for infiltration in the tests was equivalent to about one-half air change per hour.

From the assumed infiltration rate and the indoor and outdoor humidity ratio as given in Table 3, the water condensed should have been about 1.2 lb per hr. In Tests A-1 and A-2, the difference between supply and return humidity ratio indicated that about 4 lb of water were condensed per hour. The condensed water per hour as weighed, however, was apparently much less. It is, therefore, difficult to determine how much latent heat was involved in the tests.

In all of the four tests it can be seen that between one-fourth and one-half of the total dry bulb temperature rise occurred in the feeders and in the loop even at 3:00 p.m. when the maximum cooling load occurred. This indicates that the house was not getting the full benefit of the cooling system because heat was transferred to the air by the earth in rather large quantities.

Mr. Achenbach also inquired whether condensation had been found in the floor ducts. It can be seen in Fig. 8 that the difference between the minimum floor temperature and the maximum dew-point was as small as 1 deg. The surfaces of the sub-floor ducts under these conditions must have been lower than the dew-point.

From Table 4 the ceiling time lag was apparently small, whereas it would be expected that a ceiling having 3⅝ in. rock wool insulation would have considerable time lag.

Mr. Achenbach suggested that the cooling load derived from the condenser heat rejection (Item 17, Table 3) is probably a better measure of the net cooling load than the values derived from the mass air flow and the enthalpy change in the cooling coil. This is probably due to the difficulty in accounting for moisture that was condensed.

A. B. NEWTON, Wichita, Kan., suggested that the suction and discharge pressures should be included with the tests. He noted that the temperature rise as shown under Item 13 of Table 3 varied from 12.7 for the early tests to as high as 35 deg for later tests. It would therefore seem that the net pressure was allowed to vary considerably.

C. M. ASHLEY, Syracuse, N. Y., inquired whether it had been possible to establish a heat balance between the heat flow calculated by the heat flow meters and that obtained from the equipment. Since the floor acted as a heat sink, which would depend upon whether it was covered with rugs, it was suggested that the report should indicate whether rugs were used.

Mr. Ashley also pointed out that in a single-story building most of the heat enters in the form of radiant energy so that the floor can absorb this energy very readily and act as a heat sink. In the tests it appears that over a period of time the floor temperature had not risen.

Mr. GILKEY, in the authors' closure, replying to Mr. Gilman, stated that if the calculations for heat flow in the south wall had been made for the wall completely shaded it was probable that the values of computed and actually measured heat gains would have been quite close.

The average register air velocities in the living-room were approximately 350 fpm. It was, however, probable that the velocity varied considerably across the registers because the air flowed along the long axis of the register from the floor ducts. In future tests it is probable that floor diffusers will be used. Mr. Gilkey stated in answer to Mr. Avery's question that it had not been necessary to reduce the cooling unit capacity because the unit installed was rated at 2 tons. Calculations were based upon the assumption that 300 cfm of air could be circulated per rated ton of refrigeration, or 600 cfm for the 2-ton unit. In the tests it was found that the air circulated was 600 cfm per ton of refrigeration, and therefore the temperature of the air leaving the coil was affected and the dehumidification was less than might be expected from the compressor operating periods. The air was passing rapidly through the coil, and consequently the air temperature did not drop as much as it would have dropped if 300 cfm per rated ton had been circulated. This condition would indicate why the relative humidity was not lowered as would be expected from long compressor operation. This would cover part of Mr. Achenbach's inquiry.

Referring further to the discrepancy in the weighed amount of condensate and that which would be calculated from the humidity ratios shown in Table 3, Mr. Gilkey pointed out that it is rather difficult to obtain an accurate measure of condensate from the coil because there is a tendency for the moisture to collect on a coil (unless steady-state conditions are achieved), and then drop off the coil in irregular amounts.

It also appeared possible that the house was not getting the full benefit of the cooling equipment because of the heat gains of the floor slab from the earth. There was, however, some cooling effect during part of the time from the panel.

With regard to condensation the author stated that none had been observed either in the feeder or the loop ducts. While time lags in the ceiling were very low, an explanation was not possible because measurements had not been taken for the purpose of establishing the time lag that would be expected.

Referring to Mr. Newton's comment on the variation in temperature rise, the author pointed out that the low temperature rise was due in part to an overcharge of refrigeration in the system.

Mr. Gilkey stated that no attempt had been made to obtain a correlation from the heat flow meters and the heat balance at the cooling unit. The correlation was not attempted because the heat flow meters measured only the heat flow through the walls and the ceiling, and did not include the heat gain through the windows. In this installation the concrete floor was not covered by carpet.

The last technical paper, A Two-Sphere Radiometer, by D. J. Sutton and P. E. McNall, Jr., Minneapolis, Minn., (see this issue, p. 157) was presented by Mr. Sutton.

At the end of the technical session, Mr. Grant turned the meeting over to President Taylor who called for the report of the Resolutions Committee. This report was given by B. L. Evans.

Resolutions

WHEREAS, No set of resolutions appears adequate to tell of the virtues of this great state which the speakers have so modestly refrained from extolling, and

WHEREAS, One large ship in a small pond (we understand the reason it is small is because they need so much cooling water for their air conditioning) one small star on a flag and one small monument on the plains appear entirely in keeping with the modest statements of Texans, and

WHEREAS, The 60th Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS held in the most air conditioned metropolis in the world is now drawing to a close, and

WHEREAS, The aims of the Society have been furthered through the presentation and discussion of outstanding technical papers under the capable direction of our officers and staff, and

WHEREAS, The enjoyment of Members and Guests has been greatly enhanced due to carefully planned social, cultural and recreational events of a delightful nature, and

WHEREAS, All these combined with a record attendance and the enthusiasm of the membership have made this an outstanding meeting; therefore,

BE IT RESOLVED, That we express our sincere gratitude and thanks:

TO D. M. Mills, general chairman of the Committee on Arrangements,

TO R. J. Salinger, vice chairman, and

TO all committee chairmen and members of their committees who planned and conducted this most pleasant meeting,

TO Pres. E. G. Floeter, Jr., and the officers and members of the South Texas Chapter who contributed so much to the success of this meeting,

TO Honorary Chairman C. Rollins Gardner for his willingness to be banquet toastmaster,

TO the other Texas Chapters for their cooperation and support,

TO Mayor Roy Hofheinz and the City of Houston for their gracious welcome and hospitality, and

TO Morris Frank for his modest and humorous toastmastership at the Welcome Luncheon,

TO the daily and technical press for the support and publicity given this meeting,

TO the Chamber of Commerce and the Hotel Management for housing and caring for our needs, and the excellent service provided by the personnel of The Rice,

TO the authors and discussors of the technical papers,

TO the Ladies of Texas who so graciously assisted in the hospitality and made the stay of the visiting ladies so enjoyable,

To Dr. W. W. Kemmerer for his courtesy in preparing his talk on An Educator Looks at Air Conditioning for our banquet,

TO Walter L. Fleisher whose contribution to our Society's aims has here been recognized by the award of the F. Paul Anderson Medal, and

TO all others who have contributed to the success of this meeting by their work and attendance.

Respectfully submitted,

The Resolutions Committee

B. L. Evans, *Chairman*, St. Louis, Mo.
F. H. Faust, Bloomfield, N. J.
C. B. Gamble, New Orleans, La.

President Taylor announced that the final registration figures were: Members — 607; Ladies — 272; Guests — 223; Total — 1102.

President Taylor announced that the officers for the year 1954 would be installed at the Annual Banquet to be held at 7:00 p.m.

As there was no further business, the 60th Annual Meeting was adjourned at 4:30 p.m.

Entertainment Highlights

The entertainment got under way on Sunday afternoon with a motor tour of Houston's residential sections, and coffee served Texas style in the Sam Houston Room at the Rice Hotel for early arrivals and their guests.

Several of the entertainment events were indigenous to Texas. Over 300 members and guests went to the Shamrock Hotel on Sunday evening and enjoyed an excellent dinner and show at the Southwest's most famous hotel.

Morris Frank, of the *Houston Chronicle*, self-admitted perennial greeter for the city of Houston was a very humorous toastmaster at the Monday Welcome Luncheon, which was attended by 385, and introduced the local and visiting dignitaries with appropriate remarks. Mayor Roy Hofheinz officially welcomed the Society to Houston and in passing, mentioned a few of Houston's claims to fame with true Texas *modesty*.

Eleven buses, a boat and several private vehicles carried 482 people through Houston's industrial area and over the Gulf Freeway to the San Jacinto Monument and the Battleship Texas on the Monument Grounds on Monday afternoon. A Texas shore dinner at the San Jacinto Inn, served family style, followed the tour of the historical sites and everyone enjoyed having *all he could eat*.

The Ballroom of the Rice Hotel had a festive air on Tuesday evening as 417 congregated to savor the culinary delights of a Mexican dinner. Many stayed for the informal entertainment and dancing which followed.

A luncheon together with a style show by Battlesteins of Houston entertained 250 ladies in the Empire Room of the Rice on Tuesday while 306 of the distaff side saw *The Country Girl* at the Playhouse Theater (the theater in the round) on Wednesday afternoon.

The introduction and installation of newly elected officers by Reg. F. Taylor and Merrill F. Blankin and the able toastmastership of C. Rollins Gardner were highlights of the Annual Banquet attended by 507. Featuring Texas steer T-bone steak and followed by dancing, the banquet was a gastronomical as well as a social success. Dr. W. W. Kemmerer, director, Houston World's Fair, in his talk *An Educator Looks at Air Conditioning*, described the plant at the University of Houston and the influences of air conditioning on education. Reg. F. Taylor was presented with the past-president's medal by Merrill F. Blankin. Walter L. Fleisher was honored for his achievements in the field of air conditioning for human comfort by the award of the F. Paul Anderson Medal for 1953, and Dorothy Mildner's 30 years of service to the Society in the headquarters office were recognized with a citation presented by John W. James on behalf of the Society.

One interesting sidelight on the meeting was the consumption of 93 gal of coffee, and large quantities of tea and soft drinks during the four day registration period at the very popular hospitality room which was maintained by the Texas Chapters.

Two inspection trips on Tuesday and meetings of numerous committees, the Council and Committee on Research, rounded out the full schedule of activities. There were two meetings of the Council, Committee on Research and Chapters Conference Committee and meetings of the Executive, Finance, Ways and Means, Nominating, and Long Range Planning Committees, as well as meetings of the TAC's on Heat Flow Through Glass, Heat Pump, Plant and Animal Husbandry, Weather Data, Evaporative Cooling, Sorption, and the Joint Committee on Revision of the Code of Minimum Requirements for Comfort Air Conditioning.

Summary of Chapter Meetings

ST. LOUIS CHAPTER MEMBERS ENLIGHTENED BY TALK ON "HUMAN ENGINEERING"

L. Walter Moon, life member of ASHVE, at St. Louis Chapter meeting

Dr. W. E. Van Taay speaking at the December meeting of St. Louis Chapter, with E. T. Clucas, program committee chairman, seated at left

W. C. B. Sodemann, life member of ASHVE, with Mrs. Sodemann at St. Louis Chapter meeting

St. Louis ASHVE Chapter Members held a special Ladies Night meeting, called to order at 8:30 Friday evening, December 11, 1953, by Pres. H. C. Sharp in the Crystal Room of the Missouri Athletic Club. After individual recognition of the officers and board of governors, he introduced three Life Members and their wives — Mr. and Mrs. R. M. Rosebrough, Mr. and Mrs. W. C. B. Sodemann, and Mr. and Mrs. L. Walter Moon. Past Presidents presented were W. C. B. Sodemann '23, L. W. Moon '28, R. M. Rosebrough '31, J. W. Cooper '35, C. R. Davis '36-'37, G. W. F. Myers '36-'37, C. E. Hartwein '40-'41, M. F. Carlock 42-'43, W. J. Oonk '45-'46, B. C. Simons '46-'47, B. L. Evans '48-'49, W. A. Russell '49-'50, L. L. Hamig '51-'52 and C. H. Burnap '52-'53. Everyone replied to his own introduction with suitable remarks. Chapter Treasurer, F. E. Ince, was unable to attend. President Sharp complimented E. T. Clucas for his untiring efforts in arranging for such a large meeting and for personally contacting so many people to result in the large attendance, 147 members and guests being present.

He then turned the meeting over to Mr. Clucas, chairman of the meeting, whose first act was to thank members and their wives for attending. He also extended his appreciation to committee members who assisted with the meeting arrangement.

H. C. Sharp, president of St. Louis Chapter, introducing C. H. Burnap, past president and member of Board of Governors

At the request of Mr. Clucas, W. P. Norris read a Christmas essay written by Henry Van Dyck in 1905.

Mr. Clucas then introduced the speaker of the evening, Dr. W. E. Van Taay. During his introduction, Mr. Clucas stated that Dr. Van Taay was graduated from Marquette University and University of Wisconsin, had his doctor's degree in both law and sociology, and was at present, professor of psychology and sociology at Fontbonne College, St. Louis.

Dr. Van Taay chose as his subject *Human Engineering*. From the outset, Dr. Van Taay proved himself a capable, forceful and entertaining speaker. He prefaced his speech with a series of extremely humorous remarks, but easily moved into more serious discussion. His basic theme was that failure of human relations was the cause of most of our troubles. He stated that atomic energy was not in itself to be feared, but rather the philosophy of those who possess its secret.

Dr. Van Taay said preconceived prejudices were the cause of much unhappiness and that many physical ills, such as ulcers, were the result of mental illness. Dr. Van Taay believes application of Christ's philosophy should be the basis of all human relations and the foundation of human engineering. He proved himself a superb speaker by commanding the attention and interest of everyone present, and at the conclusion of his talk, received rousing applause.

The meeting adjourned at 10:15 and each person present left feeling much enlightened and happier for having attended.

• *ST. LOUIS*: Pres. H. C. Sharp called the January meeting to order and introduced Professor Bolstad of the Mechanical Engineering Department of Missouri University, who stated that he was interested in creating a short air conditioning course at the University for draftsmen, estimators, salesmen, etc., and that he was approaching the St. Louis Chapter to determine the need of such a course and to suggest the compiling of a mailing list to advertise the course.

C. B. Briscoe, director of Public Utilities and chairman of the Airport Commission, St. Louis, Mo., was the guest speaker of the evening. Mr. Briscoe outlined the problems of his office, particularly stressing the problems encountered by the Water Dept. and the St. Louis Airport. His speech was well prepared and the members were very impressed.

Following Mr. Briscoe's talk, L. L. Hamig, consultant mechanical engineer, discussed air conditioning systems required for cooling planes. Both men were given a rousing applause for their excellent presentations and an interesting discussion period followed. Attendance 49.

• *ARKANSAS*: The January meeting of the Arkansas Chapter was called to order by Pres. Herman Cumnock at the Sam Peck Hotel, Little Rock.

R. E. Blaylock presented Roy Hogan and Bruce Menees, Arkansas Power and Light Co., the speakers of the evening. Their talk was entitled *Heat Pumps and Their Performance*. An interesting discussion followed this informative talk and a hearty round of applause was given to the two speakers. Attendance 35. Attendance ratio 0.36.*

• *ATLANTA*: Pres. J. G. Croley called the meeting to order and proceeded to read the minutes of the previous meeting which were approved as read.

L. G. Miller, former Dean of Engineering at Michigan State College and Technical Consultant to NWAHACA was the guest speaker of the evening. Dean Miller gave a very enjoyable and enlightening talk on comfort requirements. He particularly stressed comfort requirements which applied to school rooms and emphasized warm air heating. An interesting and lively discussion session followed and Dean Miller was thanked for his fine talk. Attendance 65.

• *ATLANTA*: Reg. F. Taylor, Society president and consulting engineer, Houston, Tex., was the guest speaker at the December meeting. The topic of Mr. Taylor's speech, *Some Unusual Situations Encountered in Air Conditioning Design*, proved to be very valuable and an interesting discussion followed.

Pres. J. G. Croley called the meeting to order at Mammy's Shanty Restaurant. The minutes of the previous meeting were read and approved after which the meeting was adjourned. Attendance 73.

• *BALTIMORE*: In accordance with custom, the January meeting was a joint meeting with the Washington, D.C., Chapter of ASHVE and the Baltimore-Washington Sections of *ASRE*, and was held in the Officers Club at the U. S. Naval Gun Factory.

The speaker for the evening was C. A. Scarlotte, editor of *The Westinghouse Engineer*. Mr. Scarlotte's subject, *Highlights of Engineering Progress*, touched on many phases of engineering from the development of pencil lead diameter light bulbs to atomic power. He stressed that many new technical developments were made in the past several years, proving that there are limitless ends to engineering. Mr. Scarlotte's talk was well received and an interesting question session followed. Attendance 130.

• *BALTIMORE*: The Baltimore Chapter called the December meeting to order at the Engineer's Club of Baltimore. The meeting was the annual Christmas Party and the usual business meeting was dispensed with. The party was a huge success and everyone had a most enjoyable time.

• *BRITISH COLUMBIA*: One of Canada's best known scientists, Dr. Gordon Shrum, head of the Department of Physics at the University of British Columbia, was the guest speaker at the January meeting. Introduced by D. W. Thomson, Dr. Shrum's talk, *What About Atomic Power?*, related the critical shortage of energy in the world to that available from atomic power. This was a fascinating and humorous talk and was followed by an interesting question and answer period.

Vice-Pres. S. C. Gale called the meeting to order at the Quadra Club. Cornelius van Boeyen, finance chairman, reported on the chapter's financial status and commented on the rapid payment of dues. Attendance 39.

• *CENTRAL OHIO*: The January meeting was presided over by Pres. N. T. Hess. President Hess discussed the idea of the Chapter doing some civic project and a committee was formed with R. S. Curl as chairman.

The guest speaker of the evening was H. D. Jones, chapter member, Chicago, Ill. Mr. Jones' talk was entitled *Cabinet Heating and Cooling Units*. His discussion was well prepared and the question and answer period that followed was also very interesting.

The minutes of the November meeting were read and approved after which the meeting was adjourned. Attendance 40. Attendance ratio 0.30.

• *CINCINNATI*: The January meeting was called to order by Pres. R. C. Beineke at the Engineering Society of Cincinnati.

J. W. May was the guest speaker for the evening and his subject of discussion was entitled *The Application of Air Filters.* His talk was both interesting and instructive and of value to all present.

A favorable report concerning the Chapter's treasury was given by R. G. Anderson. Reports were also presented by R. E. O'Connor — publicity chairman; K. B. Little — membership chairman; and A. W. Edwards — chairman on Society affairs. Attendance 37. Attendance ratio 0.32.

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*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

• *EMPIRE STATE CAPITAL*: At the January meeting, Mr. Johnson of the United States Weather Bureau, Albany, N. Y., was the guest speaker. Mr. Johnson discussed the background of the weather forecasting in this country, and reported that there are over 350 stations in the United States. It was noted that some of these stations are operated by families while others are maintained by paid personnel. Albany records date back to 1795 and in recent years it has been noticed that since 1900 a general warming phase has occurred; less in the Northeast than in the rest of the country. An interesting question and answer period followed Mr. Johnson's highly entertaining talk.

A special report was made on the progress of the Ladies' Night preparations. It was announced that Harry Horowitz would be chairman and that M. M. Cohn would be co-chairman of this affair.

The January meeting was called to order by Pres. N. W. Burrill at Panetta's Restaurant. Attendance 33. Attendance ratio 0.47.

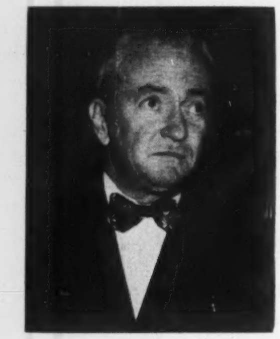
• *GOLDEN GATE*: Pres. J. E. Murray called the January meeting to order at the Engineers Club of San Francisco. The minutes of the October and November meetings were read and approved after which the guest speaker was introduced.

Norman Sharpe, head, Air Conditioning and Refrigeration Dept. of California State Polytechnic College, San Luis Obispo, presented a talk entitled *Air Purification as a Means of Reducing Air Conditioning Equipment and Duct Sizes.* He discussed the recirculation and purification of air and its economy. An interesting question and answer period followed.

Reports were given by the program and membership committees after which the meeting was adjourned. Attendance 81. Attendance ratio 0.31.

• *ILLINOIS*: The January meeting of the Illinois Chapter was called to order by Pres. H. G. Chapin.

The guest speaker for the evening was N. E. Bueter, consulting engineer, Chicago, Ill. Mr. Bueter is chairman of the Technical Advisory Committee of the Mechanical Construction Industry of Greater Chicago and is also past president of the *Chicago Association of Consulting Engineers*. Mr. Bueter's talk was entitled *Relations Between Consulting Engineer, Mechanical Contractor and the Owner*. Mr. Bueter pointed out that *free engineering* was done almost exclusively many years ago, and it was certainly the practice of mechanical equipment manufacturers and contractors to furnish mechanical engineering for a job. However, with the passage of time, mechanical engineering has become much more complicated.



N. E. Bueter, consulting engineer, Chicago, Ill.

A committee has been formed with representatives from the various contractors' associations and consulting engineers, and they have drawn up a recommended code of trade practice. This code spells out the responsibilities of the consulting engineers, the contractors, and the owners. This code states that standardized drawings plus standardized symbols and fees must be adhered to under the code and it also states that the performance of the job is the engineer's responsibility. Although this code has not yet been adopted, the contractors' associations unanimously agree with its principles. A very lively discussion period followed this excellent talk. Attendance 147.

• *ILLINOIS*: The guest speaker at the December meeting was K. E. Robinson of the Industrial Hygiene Department of the Research Division of General Motors Corp. Mr. Robinson's talk was entitled, *Industrial Ventilation, Distribution and Design.* His comments dealt largely with the necessity of providing adequate makeup air to compensate for the air exhausted from the plant. Mr. Robinson drew on his wide experience with many plants, citing actual case histories with illustrations of problems and their solutions. He pointed out that very frequently proper makeup air makes possible the reduction in exhaust equipment by establishing proper flow patterns of the air within the plant to adequately control any contaminants that might be generated in the manufacturing area. Mr. Robinson feels that the industrial ventilation engineer should be seriously criticized for repeatedly overlooking the need for makeup air.

Pres. H. G. Chapin opened the meeting at the M & M Club in the Merchandise Mart. E. P. Heckel, Sr. presented a Life Membership certificate to John J. Haines; S. R. Lewis presented a Life Membership certificate to S. L. Haas; and C. W. Deland presented a Life Membership certificate to E. J. Gossett. Attendance 146.

• *INDIANA*: The Indiana Chapter held its annual Christmas Party and as this was strictly a joyous occasion no business meeting was held. All present at the party had a merry time.

• *INLAND EMPIRE*: This meeting was the Annual Ladies Night which was held at the B. O. F. Lodge. A delicious dinner was served followed by the awarding of presents. Entertainment was furnished by the Lodge which included a floor show and dancing. A pleasant evening was had by everyone. Attendance 55.

• *IOWA*: At the January meeting the guest speaker was Harold Kinney, Fisher Governor Co., Marshalltown, Ia. Mr. Kinney presented a very interesting and instructive talk on the design of available types of pressure regulators and their operating characteristics. He outlined the limitations of each type of pressure regulator and the type of application to which they were adapted. Following this discussion Mr. Kinney answered questions from those present.

Pres. J. F. Sandfort called the meeting to order by reading the minutes of the previous meeting, which were approved as read. Attendance 40. Attendance ratio 0.52.

• *KANSAS*: F. B. Minx, sales manager, Wagner Electric Corp., Kansas City, was the guest speaker at the December meeting. His subject was *How to Select Alternating Current Motors for Application to Air Conditioning, Heating, Ventilating and Refrigeration Equipment.* Mr. Minx supplemented his talk with diagrams of increment motor and starting combinations for reducing current inrush at motor start. Following Mr. Minx' talk a most interesting question and answer period ensued.

Pres. R. L. Pennington called the meeting to order at the Broadview Hotel where after the reading of the minutes the meeting was adjourned. Attendance 26. Attendance ratio 0.25.

• *KANSAS CITY*: The January meeting was called to order at the Wishbone Restaurant by Pres. G. H. Stoffer. The minutes of the December meeting were read and approved and the Spring Party was discussed and voted upon.

W. P. Chapman, of the National Tube Division of United States Steel Corp., Pittsburgh, was introduced as the guest speaker. His subject was entitled *Recent Developments in Radiant Heating*, and was well received and an interesting discussion period followed.

Following the meeting, a film of the Minneapolis Lakers Basketball Team was shown through the courtesy of W. A. Reichow and E. M. Hopkins. Attendance 80.

• *MANITOBA*: A Christmas Party was held at Jacks Place where members and friends had a more than merry time. Dinner and dancing were enjoyed by all 93 present. There was no business conducted at this meeting.

• *MIAMI VALLEY*: O. B. Reemelin, vice president of Dayton Power and Light Co., was the guest speaker at the December meeting. In his talk entitled, *Dayton's Underground Water Supply*, Mr. Reemelin discussed Dayton's water supply and wells as well as the condition of the water table in that area. A series of slides of the rivers at various conditions of flow was shown and Mr. Reemelin reported on the plans to develop the water ways into beautiful rivers and streams the year round. An entertaining evening was enjoyed by all and Mr. Reemelin concluded his talk by answering various questions pertaining to the water systems.

Pres. J. M. Schweiger called the meeting to order and read the minutes of the previous meeting. A report on the Chapter's financial status was read and a healthy balance was reported to be on hand. Attendance 22. Attendance ratio 0.28.

• *MICHIGAN*: The December meeting was called to order by Pres. R. H. Oberschulte in the quarters of the Engineering Society of Detroit. This was the annual Joint Meeting with the Detroit Section of the *ASRE*.

The meeting was then turned over to D. S. Falk, chairman of the Detroit Section of *ASRE* and secretary of the Michigan Chapter, who introduced J. W. Kreuttner, vice president of Buensod-Stacey Co., New York City. His topic for discussion was entitled *Air Conditioning the City-County Building.* Mr. Kreuttner explained that the architects for the Detroit City-County Building decided that the air conditioning system used should meet 11 requirements as follows: economical first cost; ability to condition all areas, both exterior and interior zones, with one system; ability to cool or heat any area at any time; ability to heat and cool with the same medium; system to be free of odor, dirt, bacteria, and mold; system to be flexible and easily zoned; ease of maintenance; system to be used with or without direct radiation; system to be quiet in operation; simplicity of control; and constant volume of air delivered to all zones at all times. Mr. Kreuttner then discussed various other types of applications of air conditioning systems. After this informative and entertaining talk a lively discussion followed. Attendance 200. Attendance ratio 0.53.

• *MISSISSIPPI*: The January meeting of the Mississippi Chapter was held at the Edwards Hotel. Pres. I. E. Rowe presided and he proceeded to read the minutes of the previous meeting.

W. H. Lambreth, chairman of the Auditing Committee, reported that the books had been audited, found in order and passed to the new officers.

A. Hanson, vice president of Dray-er-Hanson, Inc., was introduced as the guest speaker. *Fundamentals of Design and Application of Extended Surface Coils* was the title of his talk which was greatly enjoyed by all present. A lively discussion period followed this informative discussion. Attendance 32.

• *MONTREAL*: The December meeting of the Montreal Chapter was called to order in the Windsor Station Restaurant by Pres. B. J. Horsburgh. The minutes of the previous meeting were read and approved.

Mayor Camillien Houde was the guest of honor and the Chapter presented him with a memento of the occasion. The Mayor responded in his inimitable way and spoke of the Society's work, its operations, and objectives. President Horsburgh then reminded the members that when the Society's Annual Meeting was entertained here the Mayor had played a large part in making them welcome.

C. E. Campeau was introduced as the speaker of the evening and his subject was entitled *Planning and Traffic in the City of Montreal.* Mr. Campeau brought the subject of traffic into clear focus and as it is of vital interest to all citizens of Montreal his speech was very well received.

At the end of the meeting the annual Christmas Party was held and the evening was a huge success. Attendance 85.

• *NORTH JERSEY*: Pres. F. H. Faust called the January meeting to order and turned the meeting over to H. M. Patrick. Mr. Patrick announced that the first part of the evening's program would be a sound film describing the aero-dynamic effects of different designs of inlets on air ducts. This film was supplied by the American Air Filter Co. and aptly demonstrated, in a clear and concise manner, the basic principles underlying correct inlet duct designs.

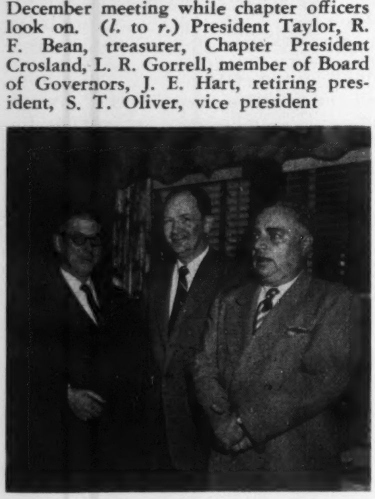
The second part of the evening was turned over to the guest speaker, G. F. Landgraf, vice president in charge of engineering, Trion, Inc., McKees Rocks, Pa. Mr. Landgraf described with illustrations the history and operating principles of electro-static air filters, including application and demonstration of electrostatic precipitation. His talk proved very interesting and enlightening and aroused considerable discussion. Mr. Landgraf was tendered an appropriate vote of thanks after which the meeting was adjourned. Attendance 27.

• *NORTHEASTERN OKLAHOMA*: H. H. Korff, mechanical engineer, Johnson Service Co., Chicago, Ill., was the guest speaker at the January meeting. His subject for discussion was *New Trends in Automatic Controls*. His talk was very informative and a lively question and answer period followed.

Pres. R. W. Winget called the meeting to order in the Student Activities Building of the University of Tulsa. Attendance 34. Attendance ratio 0.46.

• *NORTHERN PIEDMONT*: Pres. J. E. Hart called the meeting to order at Bliss' Restaurant and as this was a joint meeting of the Northern Piedmont Chapter and the *ASRE* there were a number of guests to introduce.

ASHVE Pres. Reg. F. Taylor greets R. B. Crosland, Jr., newly elected president of Northern Piedmont Chapter, at its December meeting while chapter officers look on. (*l.* to *r.*) President Taylor, R. F. Bean, treasurer, Chapter President Crosland, L. R. Gorrell, member of Board of Governors, J. E. Hart, retiring president, S. T. Oliver, vice president



Pres. Reg. F. Taylor visiting with Northern Piedmont Chapter members, R. E. Mason and J. G. Hopping, Jr., before addressing their December Chapter meeting

Reg. F. Taylor, Houston, Tex., Society president, was the guest speaker and he presented a very interesting talk. He started with current ASHVE news from headquarters in New York and then covered some unusual concepts of air conditioning design. President Taylor's talk was most entertaining and a lively discussion period followed. Attendance 63.

• *OKLAHOMA*: F. A. Kohlbacher, Wagner Electric Corp., Tulsa Branch, Electrical Division, was the guest speaker at the December meeting and the subject of his discussion was entitled *Application of A.C. Motors and Motor Control to Air Conditioning, Heating, Ventilating and Refrigerating Equipment*. Mr. Kohlbacher covered the entire field of commonly used single-phase and polyphase A.C. motors and their application to this field. He touched upon the physical characteristics, components, advantages and disadvantages of the several types of single-phase and polyphase motors with recommendations as to particular types most appropriate for the specific items of equipment commonly used in heating, air conditioning and ventilating installations. The discussion was very informative and it was stressed that if the points presented were followed in the selection and sizing of motors, motor failures would be held to a minimum.

Pres. F. X. Loeffler, Jr. called the meeting to order at Beverly's Drive-In. Attendance 42. Attendance ratio 0.34.

• *ONTARIO*: Pres. N. W. Kingsland called the January meeting to order at the Royal York Hotel. The minutes of the previous meeting were read and approved.

President Kingsland then turned the meeting over to Chairman H. D. Henion who introduced the members of a panel who spoke on the subject *Does Price Bargaining Affect Engineering Standards?* The members of the panel were D. L. Angus, W. A. Connor, C. W. Gordon, R. H. Lock, K. B. Martin and John Thompson. Each gave a short talk on this very controversial subject and a very interesting discussion period followed. Attendance 97.

• *OREGON*: The Oregon Chapter's annual mixed Christmas meeting was held in the Florentine Room of the Columbia Athletic Club.

The meeting was attended by 194 members, wives and guests. Gifts of food and cash were brought by those attending for distribution to the needy by the Sunshine Division of the Portland Police Department.

T. E. Taylor, master of ceremonies, kept the meeting rolling in his inimitable fashion, and as speaker, introduced Frank Roehr, architect, who gave his impressions of heating and ventilating engineers. Other entertainment was given by R. T. Mudge and O. W. Matthews, III, by showing color movies of the Chapter's stag picnic, held last August.

• *WISCONSIN*: Pres. N. E. Hill called the December meeting to order by reading the minutes of the previous meeting which were approved as read.

F. J. Nunlist, Jr., vice president, L. J. Mueller Furnace Co., Milwaukee, was introduced as the guest speaker of the evening. Mr. Nunlist's topic of discussion was entitled *Recent Developments in Warm Air Heating*. He discussed warm air heating and perimeter heating which were used in experimental houses at the University of Illinois. Mr. Nunlist described the types of systems which were used, namely radial and loop perimeter, and also pointed out that floor registers having vertical discharge or diffusing blades were also tested. Mr. Nunlist presented a very instructive and informative talk which was illustrated by slides. Attendance 75. Attendance ratio 0.23.

STUDENT BRANCH

• *OKLAHOMA A & M;* Pres. R. P. Schmidt called the January meeting to order and proceeded to read the minutes of the November meeting.

Officers were elected for the spring semester of 1954 as follows: C. E. Durrett — *President;* Valdur Tael — *Vice president;* and R. M. Jauch — *Secretary-Treasurer.*

In place of a speaker the group made a short trip to the Clint Cook Co. where demonstrations were made showing how various ducts and connections used in duct work are fabricated. It was noted that the company had a very neat shop and everyone gained by this instructive and informative tour. Attendance 4.

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month there have been 55 applications for membership, including 1 student application and 1 reinstatement; in addition 8 advancements have been received. The names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by March 31, 1954, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

Note: †Reinstatement. *Non-member. △Advancement.

Alabama

DEYO, G. H., Br. Mgr., General Controls Co., Birmingham. REFERENCES: F. E. Baird, C. T. Cheek, C. B. Cole, J. A. Dodd.

Arkansas

KELLY, BILL, Design Engr., Kelly Engineering Service, Little Rock. REFERENCES: E. W. Daniel, Walter Keith*, W. J. Reed, J. B. Woods.

California

HELFMAN, H. N., Engr., Air Conditioning Co., Inc., Glendale. REFERENCES: L. B. Davenport, E. C. Evans, R. F. Pyle, K. D. Simon.

LARSEN, J. C., Jr. Mech. Engr., State of California, Div. of Architecture, Sacramento. REFERENCES: J. J. Grant, W. W. Kline, Arthur Roth, V. W. Thornburg.

POLHEMUS, W. B., Br. Mgr., American Air Filter Co., Inc., San Francisco. REFERENCES: R. C. Cushing, E. F. Dill, N. E. Hill, J. E. Murray.

Colorado

ASMUSSEN, A. H., Mech. Estimator, Htg., Johnson & Davis Plbg. & Htg. Co., Denver. REFERENCES: A. W. Cooper, K. J. Murray, L. D. Niblack, P. C. Von Rosenberg.

CUENIN, M. L., Draftsman, Fox Metal Products Corp., Englewood. REFERENCES: J. F. Cipra, Jr., W. R. Dowdle, F. R. Pettigrew, J. D. Willoughby.

Connecticut

PERRY, MORRIS, Pres. & Gen. Mgr., Sussman & Perry, Inc., Willimantic. REFERENCES: A. W. Buchanan*, F. E. Segerberg*, A. R. Sharpe*, H. A. Stockberger*.

District of Columbia

ATTRIDGE, N. J., Application Engr., Westinghouse Electric Corp., Washington. REFERENCES: A. E. Beitzell, J. W. Booker, J. H. Crawford, Jr., J. M. Stokley*.

Georgia

DOBBINS, E. H., Sales Engr., Carrier Atlanta Corp., Atlanta. REFERENCES: L. L. Barnes, J. G. Croley, C. F. Daugherty, Jr., S. N. Roberts.

PETERSON, H. C., Sales Engr., Carrier Atlanta Corp., Atlanta. REFERENCES: L. L. Barnes, J. G. Croley, C. F. Daugherty, Jr., C. F. Hampton.

Illinois

△LEE, J. C., Asst. Supvsr., Armour Research Foundation, Chicago. REFERENCES: R. A. Budenholzer*, I. B. Fieldhouse*, W. P. Greene*, O. E. Teichmann*.

NECHINE, L. M., Works Mgr., Chicago Pump Co., Chicago. REFERENCES: T. H. Creears, J. M. MacCrea, E. J. Richard, R. K. Rothrock.

Louisiana

JESKIN, B. B., Mech. Engr., George P. Rice, Cons. Engr., New Orleans. REFERENCES: J. Y. Feitel, J. J. Friedler, W. B. Moses, Jr., D. J. Tutt*.

NEFF, T. G., Chief Engr., Refrigeration Equipment Co., Baton Rouge. REFERENCES: C. V. Bankston, A. W. Holland, W. A. LaGrange*, E. O. Thoman.

Michigan

CLEARY, R. B., Supervisor of Construction, Office of Earl L. Confer, Archt., Detroit. References: P. S. Hosman, J. N. Livermore, H. W. Perry, G. D. Winans.

Fehring, R. H., Chief Engr., Holland Furnace Co., Holland. References: W. C. DeRoo, R. W. Roose, Henry Weyenberg, P. D. Winchester.

Minnesota

△Buck, W. B., Asst. to the Mgr., Heating and Air Conditioning Dept., McQuay Inc., Minneapolis. References: A. B. Algren, P. R. Duitch, C. E. Gausman, William Sturm.

Freeman, P. D., Engr., The Trane Co., St. Paul. References: R. T. Dean, J. W. McNamara, William McNamara, G. W. Robbins.

James, B. E., Vice Pres., McQuay, Inc., Minneapolis. References: W. B. Buck, J. R. Hertzler, A. B. Newton, W. E. Zieber.

Missouri

Edwards, C. L., Estimator, Windsor Heating & Air Conditioning Co., St. Louis. References: C. H. Burnap, E. T. Clucas, E. B. Connors, G. E. Horcht.

Pechmann, F. A., Engr., Windsor Heating & Air Conditioning Co., St. Louis. References: C. H. Burnap, E. T. Clucas, B. L. Evans, J. D. Falvey.

△Pellmounter, T. V., Appl. Engr., Johnson-Pellmounter, Kansas City. References: E. K. Campbell, Carl Clegg, L. T. Mart, H. J. O'Dower.

Wind, L. W., Distr., L. W. Wind Corp., Clayton. References: E. B. Connors, R. A. Dusard*, George Myers, H. C. Sharp.

New York

Baum, R. T., Associate, Jaros, Baum & Bolles, New York. References: F. N. Bolles*, P. B. Gordon, A. L. Jaros, Jr.*, Herbert Raisler*.

Kasner, A. S., Pres., Conditionaire Inc., White Plains. References: Frank Carnabucci*, Ned Foulds*, John Marston*, Herb Silverman*.

Nolph, C. A., Br. Mgr., Carrier Corp., Syracuse. References: R. S. Arnold, Sr., L. A. Macrow, P. D. Robson, C. F. Woese.

Smith, N. W., Research Associate, Research Dept., Revere Copper & Brass Inc., Rome. References: F. W. Hutchinson, L. J. LaTart, W. L. Lynch, D. L. Mills.

Victory, E. J., Designer Draftsman, Voorhees, Walker, Foley & Smith, New York. References: Albert Bass*, Maurice Benton, Harold Colen, Stanley Dicker.

Ohio

Bruggemann, G. D., Jr., Repr., American Radiator & Standard Sanitary Corp., Dayton. References: R. C. Allen, D. L. Berman, P. R. Helmig, F. J. Kroger.

Rueppel, C. W., Mech. Engr., Osborn Engineering Co., Cleveland. References: L. T. Avery, Dennis Boggs, J. J. La Salvia, C. W. Pressler.

Pennsylvania

Hall, J. W., Mgr., Engrg. Service Dept., The National Radiator Co., Johnstown. References: L. N. Hunter, H. A. Lockhart, E. N. McDonnell, K. O. Schlentner.

Kane, Sydney, Appl. Engr., Worthington Corp., Philadelphia. References: J. Baker*, J. H. Billings*, A. G. Mutimer, G. E. Tuckerman.

Shreve, J. E., Mgr., Engrg. Sales, J. A. Zurn Mfg. Co., Erie. References: J. B. Rishel, A. A. Sterling, Jr., N. H. Yates*, J. H. Zurn.

South Carolina

Beck, R. G., Jr., Dist. Mgr., The Trane Co., Greenville. References: G. R. Morgan, R. K. Rouse, J. E. Waldrep, H. S. Welch, Jr.

Griner, W. A., Jr., W. A. Griner Plbg. & Htg. Co., Columbia. References: A. L. Blackstone, Jr., R. F. Donovan, M. R. Durlach, Jr., F. B. Herty.

McKeown, Harry, Cons. Engr., Sumter. References: R. F. Donovan, M. R. Durlach, Jr., W. E. Kerr, V. A. Morrow.

Patterson, J. H., Gen. Mgr., Reco Tanks Inc., West Columbia. References: A. L. Blackstone, R. K. Demarest, Jr., M. R. Durlach, Jr., H. L. McDowell.

Tennessee

△Schneider, C. R., Mgr., Dealer Dept., J. W. Brooks & Sons, Chattanooga. References: H. S. Achey, L. L. Barnes, J. H. Carpenter, L. J. O'Callaghan.

Texas

Ames, J. T., Engr., Natkin & Co., Houston. References: A. J. Natkin, M. B. Peiser, R. J. Salinger, R. J. Speich.

Beurlot, C. A., Jr., Air Conditioning Design Engr., Bernard Johnson & Associates, Houston. References: E. A. Blume, J. E. Burton, C. H. Jochen, R. J. Speich.

△Farrar, B. F., Jr., Engr., Matthews Engineering Co., Dallas. References: J. P. Ashcraft, N. R. Collins Jr., E. T. Gessell, R. A. Walker.

Fenner, W. E., Application Engr., Sullivan Air Conditioning Corp., Dallas. References: Paul Barger*, J. C. Honea*, C. R. Jacobs*, W. J. Sullivan.

Harbough, W. A., Engr., Straus-Frank Co., Houston. References: Sidney Bromberg, W. D. Moody, I. A. Naman, R. J. Salinger.

Joseph, J. G., Estimator, Johns-Manville Sales Corp., San Antonio. References: R. W. Kotzebue, Jr., W. H. Peck, W. C. Saunier, M. E. Staley.

Meyer, H. L., Engr., Standard Asbestos Mfg. & Insulating Co., Houston. References: E. G. Floeter, Jr., J. R. Franklin, Norman Way, William J. Way, II.

Michaels, O. L., Jr., Pres., Santa Fe Tank & Tower Co. of Texas, Garland. References: A. P. Flannes, W. E. Frost, A. M. Kuehmsted*, M. H. Roths*.

Perlman, Morrie, Dist. Mgr., Star Steel Supply Co., Houston. References: A. B. Banowsky, B. P. Fisher, A. E. Hess, D. M. Mills.

Virginia

△Shinn, W. H., Engr., Equipment Sales Co., Richmond. References: T. C. Brown, G. W. Hewitt*, C. A. McKeeman, L. R. Wensil, Jr.

Wisconsin

Keefe, W. E., Estimator, Johnson Service Company, Milwaukee. References: H. W. Alyea, C. B. Jones, H. W. Schreiber, J. R. Vernon.

Canada

Alliston, R. J., Mgr., Insulation Div., F. Drexel Co., Ltd., Vancouver, B.C. References: D. B. Leaney, J. L. Maw, R. B. McDonell, D. W. Thomson.

Brown, K. G., Jr. Engr., Powers Regulator Co. of Canada, Toronto. References: E. G. Cronkhite, D. F. Ledgett, D. A. Stott, E. R. Turnbull.

Bushnell, H. P., Vice Pres., McCarthy & Robinson Ltd., Toronto, Ont. References: L. L. Dollinger, Jr., D. P. Giffin, J. W. Powlesland, H. R. Roth.

Lawson, A. S., Special Project Engr., Central Mortgage & Housing Corp., Ottawa, Ont. References: F. G. Chetne*, G. L. Ostiguy, E. E. Robertson, S. C. Smith.

△Libby, R. S., Pres., Libby Air Conditioning Ltd., Montreal, Que. References: J. P. Fitzsimons, F. J. Friedman, A. E. Horsburgh, B. J. Horsburgh.

△Simpkins, A. C., Secy-Treas., Reg. H. Steen, Ltd., Toronto, Ont. References: T. J. Abbott, W. J. Coates, Ernest Fox, H. R. Musson.

Steiss, C. E., Br. Mgr., Sheldons Engineering Ltd., Montreal, Que. References: W. C. Caldwell, Robert Clapperton, Arthur Nearingburg, W. D. Sheldon, Jr.

†Ste-Marie, G. P., Prof. Technician, Montreal, Que. References: A. B. Darling,

A. J. Deslauriers*, E. A. Doucet*, P. M. Lemieux*.

Wild, G. A., Mech. Engr., Dept. of Public Works, Ottawa, Ont. References: E. A. Gardner*, A. H. Hargreaves, W. D. St. Cyr, A. Webster*.

India

Chockalingham, Periyakaruppan, Mech. Engr., Sree Meeakshi Mills Ltd., Madurai. References: V. Ganesa*, E. K. Ramaswami*, K. Srinivasan*, R. Wright*.

Switzerland

Gengenbacher, Erwin, Sales Mgr., Fr. Sauter S. A., Basle. References: Herbert Brown, John Frey, Werner Niederer, Walter Sennhauser.

Student

UNIVERSITY OF OKLAHOMA, Norman, Okla. Certified by E. F. Dawson. Peard, Richard A.

OBITUARIES

REX VERNON DIES IN MILWAUKEE

J. Rexford Vernon, vice president and sales promotion manager, Johnson Service Co., Milwaukee, Wis., widely known throughout the heating and air conditioning field, died suddenly in Milwaukee on February 16, in his 56th year.

Mr. Vernon, known to his many friends as Rex, joined the Society in 1926 and was extremely active in both Chapter and Society affairs since that time. He served as President of the Illinois Chapter from 1938-39 and Treasurer from 1935 to 1938, was President of the Wisconsin Chapter in 1947-48 and also served as Secretary, Treasurer, and on many committees in that Chapter.

A member of the Public Relations Committee of the Society from 1951 to 1954, he served as its Chairman from 1952 and 1953. He also served on the Chapter Delegates Committee and in 1950 and 1951 served as Vice Chairman and Chairman of the Chapters Conference Committee. He was a member of the Society Nominating Committee in 1947. Mr. Vernon was on the Chapter Speakers List up until the time of his death and has addressed many of the Society Chapters and Student Branches throughout the United States. He has been prominently identified with engineering education and a good deal of his speaking efforts have been directed to college engineering students in order to encourage them to enter the heating, ventilating, and air conditioning profession.

Mr. Vernon joined Johnson Service Co. as a field engineer in 1923, after having worked for the State of Wisconsin as a Senior Assistant District Engineer for the period from 1919 to 1923. He was appointed Sales Promotion and Advertising Manager in 1932 with headquarters in Chicago and was transferred to Milwaukee in 1942 serving as manager of Public Relations, Sales Promotion and Advertising since that time. He was an Assistant Secretary of the Corporation from 1946 to 1950, Secretary from 1950 to 1952, and became Vice President in 1952.

He served during World War I as a Second Lieutenant in the Corps of Engineers. He was active in the *American Ordnance Association*, the *NDHA*, and was Program Chairman and member of the Professional Development and other committees of the *Engineers' Society of Milwaukee*. He was a member of the Board of Regents of the Milwaukee School of Engineering and lecturer on industrial administration at that school and at Marquette University. He graduated from the University of Wisconsin with a B.S. degree and was the author of many articles on automatic temperature control, human engineering, and career guidance for engineering students.

He is survived by his wife, two daughters and a son, to whom the Officers and Council of the Society extend their deepest sympathy. Funeral services were held at 2:00 p.m. on Saturday and interment was at Forest Hill Cemetery, Madison, Wis.

CLIFFORD A. BOOTH
Toronto, Ont., Canada

It is with regret that the Society announces the sudden death of Clifford A. Booth on January 2, 1954, at his home in Toronto. Mr. Booth was employed in the Technical Service Department of Fiberglas Canada, Ltd.

Mr. Booth was born at Toronto, Ont., Canada, on April 13, 1901, and attended the University of Toronto, graduating in 1925 with a B.A. in science. In 1925 Mr. Booth joined the Cinder Tile Co., New York, and from 1927-29 he was employed by E. J. Shepard, Ltd. and was in charge of its plant for making cinder block and in charge of sales. He acted as a lecturer in optics and photography at the University of Toronto until 1937, and between 1930 and 1940 he also was employed by the Toronto Brick Co., Ltd. doing plant and sales work. Mr. Booth joined Fiberglas Canada, Ltd. in 1940.

He is survived by his wife, Mrs. Helen Kerr Booth, a son, F. William, a daughter, Margaret, and his mother, Mrs. Katherine Booth, to whom the Society's Officers and Council extend their sincere sympathy.

LeROY E. COX
Glenridge, N.J.

The Society learned of the passing of LeRoy E. Cox on December 27 at Mountainside Hospital.

Mr. Cox, who joined the Society in 1944, was born on February 1, 1895 at Newark, N. J. where he attended high school and Newark Technical School. Mr. Cox's entire professional career was spent with Almirall & Co., Inc., which he joined in 1911. During his association with the company Mr. Cox was responsible for the installation of many New York public and high schools, Board of Transportation Power House and Shops of New York City, Pratt & Whitney plant extensions in E. Hartford, Conn., Bakelite Corp. plant extensions in Bound Brook, N. J., and T.N.T. Plant for Penn. Ordnance Works. At the time of his death he was vice president of the company.

Mr. Cox is survived by his widow and a sister, Mrs. Helen Marie Marsden to whom the Officers and Council extend their deep sympathy.

J. HOWARD SMART

New Britain, Conn.

J. Howard Smart, Society member since 1944, died on January 2, 1954, following a year's illness.

Mr. Smart, who was president of Tuttle & Bailey, Inc., New Britain, was born on May 29, 1903, at New Britain, Conn. He joined the production department of the firm in 1923 and in 1926 entered the sales division. He was made assistant sales manager in 1930 and sales manager four years later. In 1941 he became a vice president of the company, and in 1951 was made executive vice president and secretary. In September 1952 he became president. Mr. Smart served as a director of Tuttle & Bailey, Inc., Tuttle & Bailey Pacific, Inc., Hart and Cooley, Inc., and Hart & Cooley Mfg. Co.

The Officers and Council of the Society extend their deepest sympathy to Mr. Smart's widow.

ELMER TOROK

Elizabethton, Tenn.

Word has been received of the death of Elmer Torok, Society member since 1936, on December 12, 1953.

Mr. Torok was born at Budapest, attended the Technical University of Budapest, graduating in 1905 with a B.S. in mechanical engineering. In 1914 Mr. Torok joined Westinghouse Church Kerr & Co., New York, N.Y., as assistant engineer, and in 1919 was employed by the Murray Engineering Corp., also of New York, as engineer. Between 1924 and 1928 he was associated with the Brooklyn Edison Co. and in 1929 joined the North American Rayon Corp. of Elizabethton, Tenn., with whom he remained until 1942. At that time he was employed by the East Tennessee Sheet Metal Works, Inc., where he remained until the time of his death.

Mr. Torok is survived by his widow to whom the Officers and Council of the Society extend their sympathy.

Monthly and seasonal heating degree day data for 200 cities in the U. S. are being published on the first Wednesday of each month in the U. S. Weather Bureau's *Weekly Weather and Crop Bulletin, National Summary.* Subscription price for this publication is $3.00 per year. Address Superintendent of Documents, Government Printing Office, Washington 25, D. C., with remittance made payable to Superintendent of Documents.

WALTER G. W. TURNO

Newark, N. J.

The Society was sorry to learn of the passing of Walter G. W. Turno, one of its selected group of Life Members, on January 6, 1954, at Presbyterian Hospital at Newark, N.J.

Born on February 22, 1885 at New York City, Mr. Turno attended the College of the City of New York and Columbia University. While still in school he received his apprenticeship training with his father's company, the H. Turno Co., N.Y.

In 1906 he was employed by Johns-Manville Co. as draftsman and estimator. He was one of the incorporators of H. W. Porter and Co., Inc., when it was founded in 1927 by a group of Johns-Manville engineers to represent that company as its technical service unit. At the time of his death Mr. Turno was vice president and secretary of the company.

Mr. Turno, besides holding Life Membership in ASHVE, was also a Life Member of *ASME*. He was a registered professional engineer in the states of New York and New Jersey.

Surviving are his wife, Mrs. Emily Halliday Turno; two daughters, Mrs. Nathaniel Gardner, Jr., and Mrs. J. Arthur Stine, Jr.; a brother, Herbert Turno, and three sisters, Miss Irene Turno, Mrs. Harry Eldredge and Mrs. Harry Lindeman, to whom the Officers and Council extend their deep sympathy.

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ASHVE Committee on Safety Regulations for Heating, Ventilating and Air Conditioning Systems: G. P. Nachman, Chairman; F. H. Buzzard, H. W. McKenzie, B. F. McLouth, C. H. Randolph.

Awards: Linn Helander, Chairman; M. F. Blankin, G. L. Tuve

Building: A. J. Offner, Chairman; Albert Buenger, P. B. Gordon, L. E. Seeley, T. H. Urdahl.

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International Joint Committee on Psychrometric Data: C. O. Mackey, Ithaca, N. Y., Chairman; B. A. Dmitrieff, New York, N. Y., Secretary; H. H. Bruce, London; G. A. Bull, London; C. S. Cragoe, Washington, D. C.; John A. Goff, Philadelphia; L. P. Harrison, Washington, D. C.; T. J. G. Henry, Toronto; B. H. Jennings, Evanston, Ill.; F. G. Keyes, Cambridge, Mass.; R. F. Legget, Ottawa; S. G. Rison, Washington, D. C.; P. A. Sheppard, London; J. L. York, Ann Arbor, Mich.

Joint Committee for Revision of Code of Minimum Requirements for Comfort Air Conditioning: W. L. Fleisher, Chairman; (ASHVE) O. W. Armspach, A. C. Buensod, C. C. Cheyney; (ASME) C. F. Kayan; (ASRE) F. H. Faust, C. F. Holske, J. A. Schurman; (ARI) M. M. Lawler, R. A. Gonzalez; Alternate: J. R. Schreiner; (U.S. Public Health Service) W. C. Cooper, M.D.; At Large: M. K. Fahnestock, P. J. Marschall, G. E. May, A. B. Newton; (Medical Profession) R. W. Keeton, M.D., W. J. McConnell, M.D.

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To Codify Council Policies: J. H. Fox, Chairman; I. W. Cotton, A. W. Edwards, B. H. Spurlock, Jr.

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*Member of Committee on Research.

ASHVE — OFFICERS OF CHAPTERS AND BRANCHES

(55 Chapters; 1 Special Branch; 9 Student Branches)

Date indicates year organized; an address and no city shown signifies same city as headquarters; numeral in parentheses indicates zone.

- **ARIZONA:** 1953. Hdqrs., Phoenix, Ariz. PRESIDENT, V. J. Carns, 3602 No. 15th Dr. SECRETARY, A. J. Nelesen, Jr., 6744 No. 14th Pl.
- **ARKANSAS:** 1952. Hdqrs., Little Rock, Ark. Meets, Third Tuesday. PRESIDENT, R. E. Blaylock, 509 E. Markham St. SECRETARY, J. L. Brown, 212 Terminal Warehouse Bldg.
- **ATLANTA:** 1937. Hdqrs., Atlanta, Ga. Meets, Second Monday. PRESIDENT, J. G. Croley, 400 Batavia St., East Point, Ga. SECRETARY, T. A. Barrow, 157 Simpson St., N.W.
- **BALTIMORE:** 1949. Hdqrs., Baltimore, Md. Meets, Third Wednesday. PRESIDENT, H. D. Glaser, Federal Land Bank Bldg., 2315 St. Paul St. (18). SECRETARY, G. J. Senner, 6010 Edmondson Ave. (28).
- **BRITISH COLUMBIA:** 1952. Hdqrs., Vancouver, B.C., Canada. Meets, Second Wednesday. PRESIDENT, C. W. Leek, 1155 West 49th Ave. SECRETARY, D. A. English, 6412 Adera St.
- **CENTRAL NEW YORK:** 1944. Hdqrs., Syracuse, N. Y. Meets, Fourth Wednesday. PRESIDENT, C. R. Acheson, 306 W. Genesee St. SECRETARY, H. K. Ormsby, 205 S. Townsend St. (2).
- **CENTRAL OHIO:** 1944. Hdqrs., Columbus, Ohio. Meets, Third Monday. PRESIDENT, N. T. Hess, 63 E. Goodale St. SECRETARY, R. A. Wilson, 20 S. Third St., (15).
- **CINCINNATI:** 1932. Hdqrs., Cincinnati, Ohio. Meets, First Tuesday. PRESIDENT, R. C. Beineke, 626 Broadway, (2). SECRETARY, A. H. Gerdsen, 224 E. Second St., (2).
- **CONNECTICUT:** 1940. Hdqrs., New Haven, Conn. Meets, Third Thursday. PRESIDENT, G. F. Nieske, 165 Maple St., Naugatuck. SECRETARY, E. J. Hoagland, 257 S. Whitney St., Hartford.
- **DELTA:** 1939. Hdqrs., New Orleans, La. Meets, Third Tuesday. PRESIDENT, H. L. Salaun, 317 Baronne St. SECRETARY, T. J. Jenny, 1000 S. Peters St., (9).
- **EMPIRE STATE CAPITAL:** 1951. Hdqrs., Albany, N. Y. Meets, Second Wednesday. PRESIDENT, N. W. Burrill, 33 Riverside Ave., Rensselaer. SECRETARY, L. V. Appleby, 373 State St.
- **GOLDEN GATE:** 1937. Hdqrs., San Francisco, Calif. Meets, First Thursday. PRESIDENT, J. E. Murray, 350 Mission St. (5). SECRETARY, D. E. McLeod, 105 San Pablo Ave. (27).
- **ILLINOIS:** 1906. Hdqrs., Chicago, Ill. Meets, Second Monday. PRESIDENT, H. G. Chapin, 185 N. Wabash Ave., (1). SECRETARY, H. G. Gragg, Rm. 1310, 228 N. LaSalle St. (1).
- **INDIANA:** 1943. Hdqrs., Indianapolis, Ind. Meets, Fourth Tuesday. PRESIDENT, R. C. Blackman, 5505 N. Illinois St., (8). SECRETARY, J. W. Jackson, 3514 N. Drexel, (18).
- **INLAND EMPIRE:** 1950. Hdqrs., Spokane, Wash. Meets, First Friday after First Tuesday. PRESIDENT, G. M. Dieter, 917 W. Mallon. SECRETARY, F. W. Jenkinson, N. 1904 Smith St., (15).
- **IOWA:** 1940. Hdqrs., Des Moines, Ia. Meets, Second Tuesday. PRESIDENT, J. F. Sandfort, Iowa State College, Ames. SECRETARY, G. J. Kraai, 907 Sixth Ave. (14).
- **KANSAS:** 1951. Hdqrs., Wichita, Kan. Meets, Tuesday after First Monday. PRESIDENT, R. L. Pennington, 520 So. Commerce (2). SECRETARY, O. B. Strahm, 601 So. Terrace Dr.
- **KANSAS CITY:** 1917. Hdqrs., Kansas City, Mo. Meets, First Monday. PRESIDENT, G. H. Stoffer, 200 Riss Building (6). SECRETARY, A. S. Hurt, Jr., 2119 Washington St., (8).
- **MANITOBA:** 1935. Hdqrs., Winnipeg, Man., Canada. Meets, Fourth Thursday. PRESIDENT, A. K. Piercy, 222 Osborne St. N. SECRETARY, D. B. Brace, 1550 Dublin Ave.
- **MASSACHUSETTS:** 1912. Hdqrs., Boston, Mass. Meets, Third Tuesday. PRESIDENT, A. L. Hare, 127 Federal St. (10). SECRETARY, W. G. Martin, Jr., 20 Winchester St. (16).
- **MEMPHIS:** 1944. Hdqrs., Memphis, Tenn. Meets, Third Monday. PRESIDENT, A. W. Shelby, 972 Union Ave. SECRETARY, A. T. Bevil, 1638 Union Ave. (4).
- **MIAMI VALLEY:** 1950. Hdqrs., Dayton, Ohio. Meets, First Wednesday. PRESIDENT, John Schweiger, 593 Acorn Drive, Dayton (9). SECRETARY, D. E. Tullis, 743 Kiser St. (4).
- **MICHIGAN:** 1916. Hdqrs., Detroit, Mich. Meets, First Monday after 10th of month. PRESIDENT, R. H. Oberschulte, 316 McKerchey Building, (1). SECRETARY, D. S. Falk, 4864 Woodward Ave. (1).
- **MINNESOTA:** 1918. Hdqrs., Minneapolis, Minn. Meets, First Monday. PRESIDENT, V. E. Pearson, 739 Marquette Ave. (2). SECRETARY, E. T. Erickson, 500 Baker Arcade.
- **MISSISSIPPI:** 1953. Hdqrs., Jackson, Miss. PRESIDENT, I. E. Rowe, 120 Georgia St. SECRETARY, M. E. Price, 205 Arbor Hill Dr.
- **MONTREAL:** 1936. Hdqrs., Montreal, Que., Canada. Meets, Third Monday. PRESIDENT, B. J. Horsburgh, 940 Ogilvy Ave. (15). SECRETARY, R. J. Ker, 1000 Beaver Hall Hill, P. O. Box 340.
- **NEBRASKA:** 1940. Hdqrs., Omaha, Neb. Meets, Second Tuesday. PRESIDENT, O. J. Smith, 233 Grain Exchange Bldg., (2). SECRETARY, C. A. Failor, 5736 N. 33rd St. (11).
- **NEW YORK:** 1911. Hdqrs., New York, N. Y. Meets, Third Monday. PRESIDENT, J. E. Schechter, 32-08 38th Ave., Long Island City (1). SECRETARY, Carl H. Flink, 62 Worth St. (13).
- **NORTH JERSEY:** 1952. Hdqrs., Newark, N. J. Meets, Second Tuesday. PRESIDENT, F. H. Faust, 5 Lawrence St., Bloomfield. SECRETARY, C. H. Smith, 2490 Vreeland Mills Rd., Linden.
- **NORTH TEXAS:** 1938. Hdqrs., Dallas, Tex. Meets, Third Monday. PRESIDENT, M. W. Brown, 1213 Texas Bank Bldg. SECRETARY, H. G. Gregerson, 2921 Fairmount.
- **NORTHEASTERN OKLAHOMA:** 1948. Hdqrs., Tulsa, Okla. Meets, Second Tuesday. PRESIDENT, R. W. Winget, 2428 E. 11th St., Box 100. SECRETARY, J. T. McKinney, 1341 So. Boston.
- **NORTHERN OHIO:** 1916. Hdqrs. Cleveland, Ohio. Meets, Second Monday. PRESIDENT, J. M. Black, 1296 Gordon Rd., Lyndhurst. SECRETARY, Sherwood Nassau, 6014 Euclid Ave.
- **NORTHERN PIEDMONT:** 1952. Hdqrs., Greensboro, N.C. Meets, Second or Third Friday. PRESIDENT, R. B. Crosland, Jr., 1001 S. Marshall St., Winston-Salem. SECRETARY, W. H. Cooper, 1001 S. Marshall St., Winston-Salem.
- **OKLAHOMA:** 1935. Hdqrs., Oklahoma City, Okla. Meets, Second Monday. PRESIDENT, F. X. Loeffler, Jr., Box 529. SECRETARY, G. E. Ervin, 2800 N. Oklahoma St. (5).
- **ONTARIO:** 1922. Hdqrs., Toronto, Ont., Canada. Meets, First Monday. PRESIDENT, N. W. Kingsland, 31 Willcocks St. SECRETARY, H. R. Roth, 57 Bloor St., W.
- **OREGON:** 1939. Hdqrs., Portland, Ore. Meets, Thursday after First Tuesday. PRESIDENT, A. N. Hoss, 621 S.W. Alder (5). SECRETARY, J. E. Finkbeiner, 10260 S.W. Daphne Pl. (1).
- **OTTAWA VALLEY:** 1952. Hdqrs., Ottawa, Ont., Canada. Meets, Third Tuesday. PRESIDENT, G. L. Ostiguy, 282 Westhill Ave. (3). SECRETARY, N. J. Howes, Box 264, R. R. 1.
- **PACIFIC NORTHWEST:** 1928. Hdqrs., Seattle, Wash. Meets, Second Tuesday. PRESIDENT, H. T. Orebaugh, 1330 Dearborn. SECRETARY, L. F. Christofferson, 7358-58th Ave. N.E., (5).
- **PHILADELPHIA:** 1916. Hdqrs., Philadelphia, Pa. Meets, Second Thursday. PRESIDENT, C. F. Dietz, 3449 W. Indiana Ave. (32). SECRETARY, P. H. Yeomans, Architects Building (3).
- **PITTSBURGH:** 1919. Hdqrs., Pittsburgh, Pa. Meets, Third Monday. PRESIDENT, C. H. Schneider, 310 Washington Rd. SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St. (22).
- **ROCKY MOUNTAIN:** 1944. Hdqrs., Denver, Colo. Meets, First Wednesday. PRESIDENT, H. L. Wray, 1101 Geneva St., Aurora. SECRETARY, J. F. Cipra, Jr., 2676 S. Madison St.
- **SACRAMENTO VALLEY:** 1952. Hdqrs., Sacramento, Calif. Meets, First Wednesday. PRESIDENT, E. C. McKinsey, 4220 Annette (21). SECRETARY, R. A. Sarro, 5412 Argo Way.
- **ST. LOUIS:** 1918. Hdqrs., St. Louis, Mo. Meets, Second Tuesday. PRESIDENT, H. C. Sharp, 4060 W. Pine Blvd. (8). SECRETARY, W. P. Norris, 1118 Fullerton Bldg.
- **SHREVEPORT:** 1948. Hdqrs., Shreveport, La. Meets, Third Thursday. PRESIDENT, M. A. Hudson, 753 Gladstone Blvd. SECRETARY, R. S. Segall, 603 Cotton St.
- **SOUTH TEXAS:** 1938. Hdqrs., Houston, Tex. Meets, Third Friday. PRESIDENT, E. G. Floeter, Jr., P.O. Box 1657 (1). SECRETARY, F. M. Neil, 3513 W. Dallas Ave. (19).
- **SOUTHERN CALIFORNIA:** 1930. Hdqrs., Los Angeles, Calif. Meets, First Tuesday. PRESIDENT, L. B. Davenport, 137 S. Anderson St. (33). SECRETARY, J. L. McCullough, 1978 S. Los Angeles St. (11).
- **SOUTHERN PIEDMONT:** 1952. Hdqrs., Charlotte, N.C. PRESIDENT, R. S. Fullerton, P.O. Box 3697. SECRETARY, J. R. Clark, P.O. Box 1755.
- **SOUTHWEST TEXAS:** 1946. Hdqrs., San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, L. H. Hornor, Jr., 816 Insurance Bldg. SECRETARY, Boone Crisp, P.O. Box 9065, (4).
- **UTAH:** 1944. Hdqrs., Salt Lake City, Utah. Meets, Third Thursday. PRESIDENT, M. L. Gollaher, 1163 Roosevelt Ave. (5). SECRETARY, G. L. Soderborg, Sr., 42 E. 8th St. S.
- **VIRGINIA:** 1946. Hdqrs., Norfolk, Va. Meets Third Wednesday. PRESIDENT, E. D. Duval, 1023 Hanover Ave. SECRETARY, T. B. Carpenter, 412 Chester St.
- **WASHINGTON, D. C.** 1935. Hdqrs., Washington, D. C. Meets, Second Wednesday. PRESIDENT, J. G. Muirheid, Bureau of Ships, Navy Dept. (25). SECRETARY, W. C. Reamy, Jr., 17th & Pennsylvania Ave., N. W. (6).
- **WEST TEXAS:** 1953. Hdqrs., Lubbock, Tex. PRESIDENT, L. C. McKay, 210 Sanford Bldg. SECRETARY, J. C. Wharton, Box 1240.
- **WESTERN MICHIGAN:** 1931. Hdqrs., Grand Rapids, Mich. Meets. Second Monday. PRESIDENT, J. T. Anderson Michigan State College, East Lansing. SECRETARY, N. A. Buckley, 514 Park Rd., Jackson.
- **WESTERN NEW YORK:** 1919. Hdqrs., Buffalo, N. Y. Meets, Second Monday. PRESIDENT, C. W. Stone, 1219 Main St. (9). SECRETARY, C. W. Kaupp, 271 Delaware Ave.
- **WISCONSIN:** 1922. Hdqrs., Milwaukee, Wis. Meets, Third Monday. PRESIDENT, N. E. Hill, 122 N. Hartwell Ave., Waukesha. SECRETARY, K. H. Forfar, 2711 N. 27th St. (10).

SPECIAL BRANCH

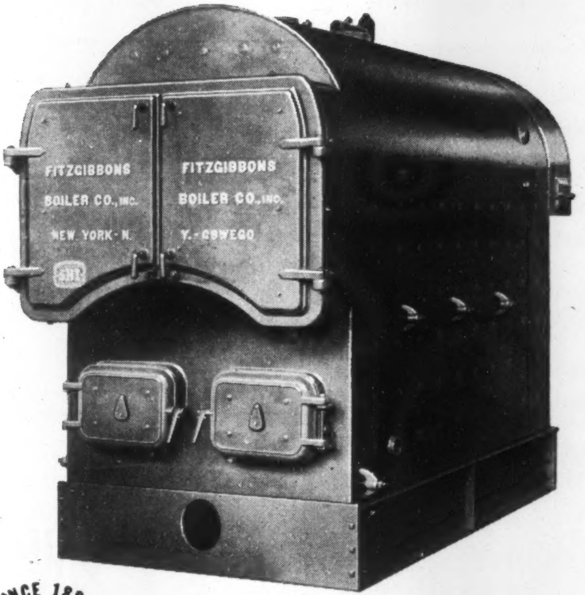
- **SWISS:** 1952. Hdqrs., Zurich, Switzerland. PRESIDENT, Leo de Bruyn, Muhlebachstr, 172, Zurich. SECRETARY, Walter Hausler, Erbstrasse 2, Kusnacht, Zurich.

STUDENT BRANCHES

- **NORTH CAROLINA STATE COLLEGE:** 1948. Hdqrs., Raleigh, N. C. PRESIDENT, Norman Falbaum, Box 4668, State College Station. SECRETARY, J. L. Flowers, Apt. 33-E, Vetville.
- **OKLAHOMA A. & M. COLLEGE:** 1950. Hdqrs., Stillwater, Okla. PRESIDENT, C. E. Durrett, 1215 College. SECRETARY, R. M. Jauch, 308½ W. Maple.
- **OREGON STATE COLLEGE:** 1949. Hdqrs., Corvallis, Ore. Meets, First Wednesday after First Tuesday PRESIDENT, R. E. Bulletset. 252 Kings Rd. SECRETARY, I. P. Parkhurst, 1354 Harrison.
- **PURDUE UNIVERSITY:** 1948. Hdqrs., W. Lafayette, Ind.
- **TEXAS A. & M. COLLEGE:** 1946. Hdqrs., College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, D. F. Carroll, Box 6264. SECRETARY, C. W. Farrar, Jr., Rt. 1, Box 339, Bryan.
- **UNIVERSITY OF DETROIT:** 1949. Hdqrs., Detroit, Mich. Meets, First Tuesday. PRESIDENT, J. R. Cairns, 4001 Florence, (21). SECRETARY, W. E. Zimmerman, 15359 Lauder (27).
- **UNIVERSITY OF KANSAS:** 1949. Hdqrs., Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.
- **UNIVERSITY OF TEXAS:** 1949. Hdqrs., Austin, Tex. Meets, First and Third Tuesday.
- **UNIVERSITY OF TORONTO:** 1951. Hdqrs., Toronto, Ont. CHAIRMAN, Alexander Tudor, 75 South Dr. SECRETARY, T. M. Devine, More House, St. Michaels College.

THE NEW LORD & TAYLOR STORE IN WEST HARTFORD, CONN.
Architect: Irving W. Rutherford, Hartford, Conn.
Consulting Engineer: Harry H. Bond, New York, N. Y.
Heating Contractor: Eugene J. Brandt & Co., Inc., New York, N. Y.

As modern as the store it serves



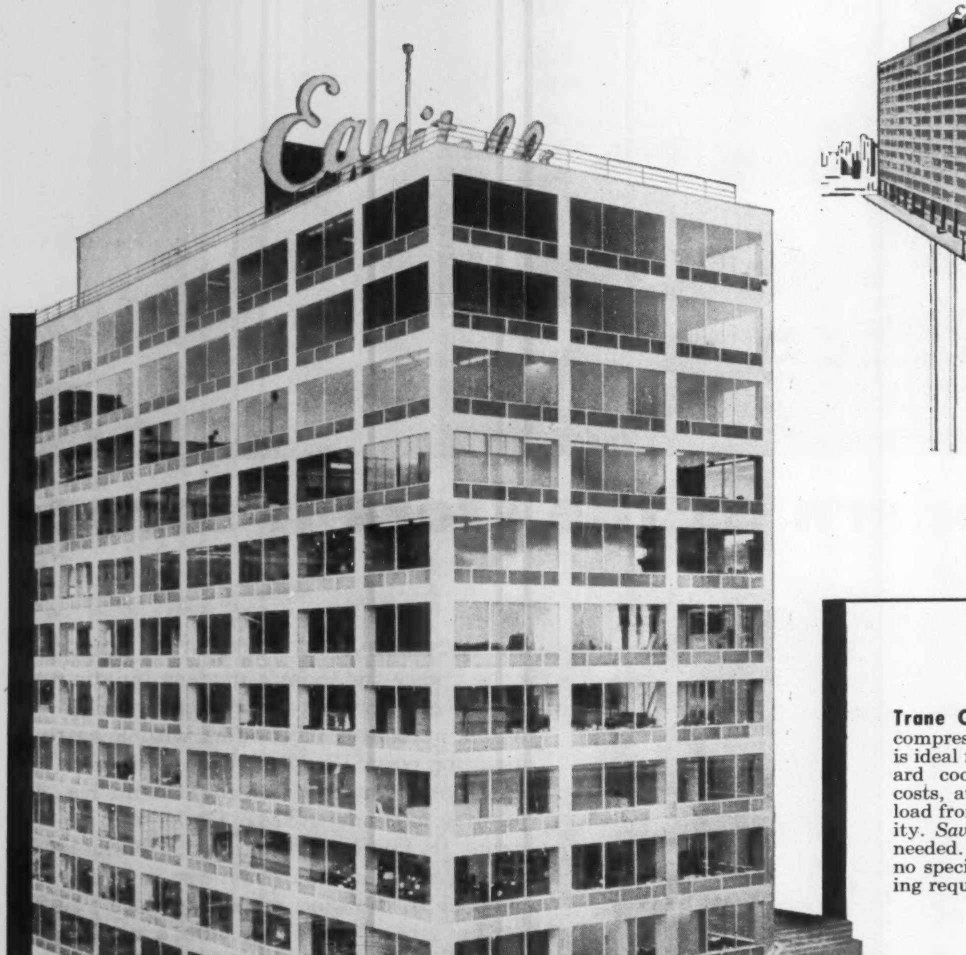
THE FITZGIBBONS "D" TYPE STEEL BOILER is the choice for today's modern building because of its proven ability to provide up-to-date standards of comfort with lowest operating costs. Fitzgibbons design has no equal, and construction meets and frequently exceeds, ASME Code requirements. Its fine reputation among building owners, architects and engineers is further evidence of the kind of performance you can be sure of obtaining with a modern Fitzgibbons boiler installation. For complete details on the Fitzgibbons "D" Type boiler, write the Fitzgibbons Boiler Company, 101 Park Avenue, New York 17, N.Y. Ask for Catalog HP-3

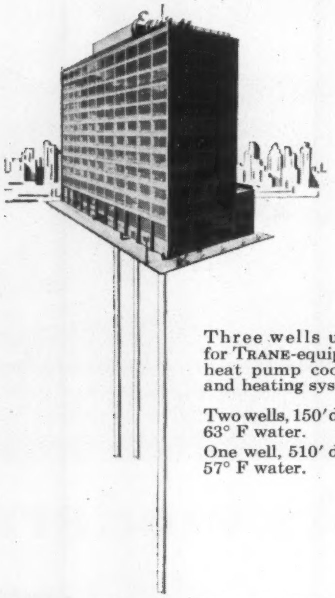
SINCE 1886
MOST ECONOMICAL IN FUEL
1886
THE FITZGIBBONS BOILER

The Fitzgibbons Boiler® SBI

Trane heat pump sets

Engineers of Portland's 12-story provides heat for only 16%





Three wells used for TRANE-equipped heat pump cooling and heating system.

Two wells, 150' deep, 63° F water.
One well, 510' deep, 57° F water.

→

Trane CenTraVac, refrigeration compressor from 50 to 400 tons, is ideal for heat pump or standard cooling jobs. *Cuts power* costs, automatically adjusts to load from 10% to 100% capacity. *Saves labor*—no attendant needed. *Simplifies installation*—no special base or sound-proofing required.

one source

new economy record!

Equitable building report heat pump of district steam costs!

- If district steam had been used for heating, total year-'round *heating-cooling* costs would have been *64% greater*.
- A total of 37% of the entire heating need was met with "*by-product*" heat—heat salvaged from the cooling process during those periods when heating and cooling were both required.
- Combined heating and cooling costs were 11.3 cents per sq. ft. (*less than half* the average for air conditioned office buildings in the U.S.)

These are findings reported by the installation's designer, J. Donald Kroeker, consulting engineer—as taken from a recent report to the A.S.H.V.E. and published in the November, 1953, issue of Heating, Piping & Air Conditioning.

This outstanding economy record was set by a 540-ton year-'round heat pump. A complete TRANE installation, including 4 hermetic centrifugal compressors, fans, coils and circulators.

The installation fully exploits Portland's low electrical rates, availability of well water at two temperatures from 57° to 65°, relatively mild climate and other favorable factors. While these conditions are not generally so favorable in most areas, your investigation of the heat pump for year-'round air conditioning may save thousands of dollars per year.

The New Trane CenTraVac—heart of an efficient heat pump installation

Fundamental to a low-cost operation in any heat pump installation is the system's ability to closely match power input to widely varying load conditions. The new TRANE CenTraVac (current model of the TRANE Centrifugal Compressors used in the Equitable job) has automatic, *continuously-variable* capacity control from 10% to 100%. This limits power use to the load requirement for outstanding economy.

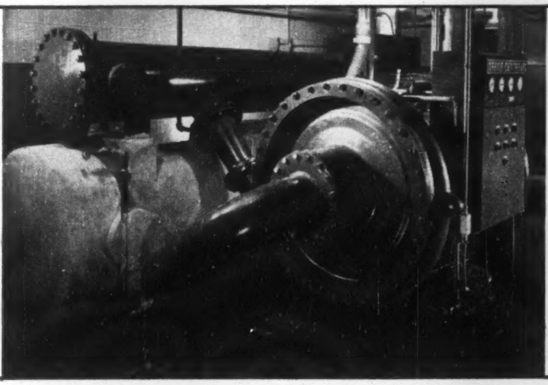
Completely automatic CenTraVac permits unattended operation

The fully automatic design of the TRANE CenTraVac leaves the system supervisor free for other duties. The only *hermetic* centrifugal refrigeration unit on the market, its exclusive design eliminates shaft seals . . . frequent cause of breakdowns. Direct drive eliminates noisy, power-wasting gear boxes.

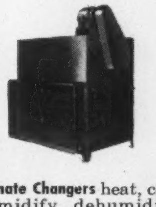
One source—One responsibility

The complete TRANE line of matched cooling-heating products simplifies design, procurement, follow-through. You have *one* source, *one* responsibility, and the ready cooperation of the largest group of technically-trained sales engineers in the industry.

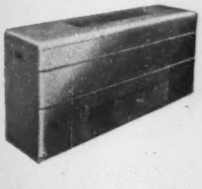
See your TRANE Sales Office or write TRANE, La Crosse, Wis. Just ask for CenTraVac Bulletin DS-399.



Trane Unit Air Conditioners For Any Need



Climate Changers heat, cool, humidify, dehumidify, filter air. Multi-zone models provide up to 6 (or more) zones with different climates at the same time.

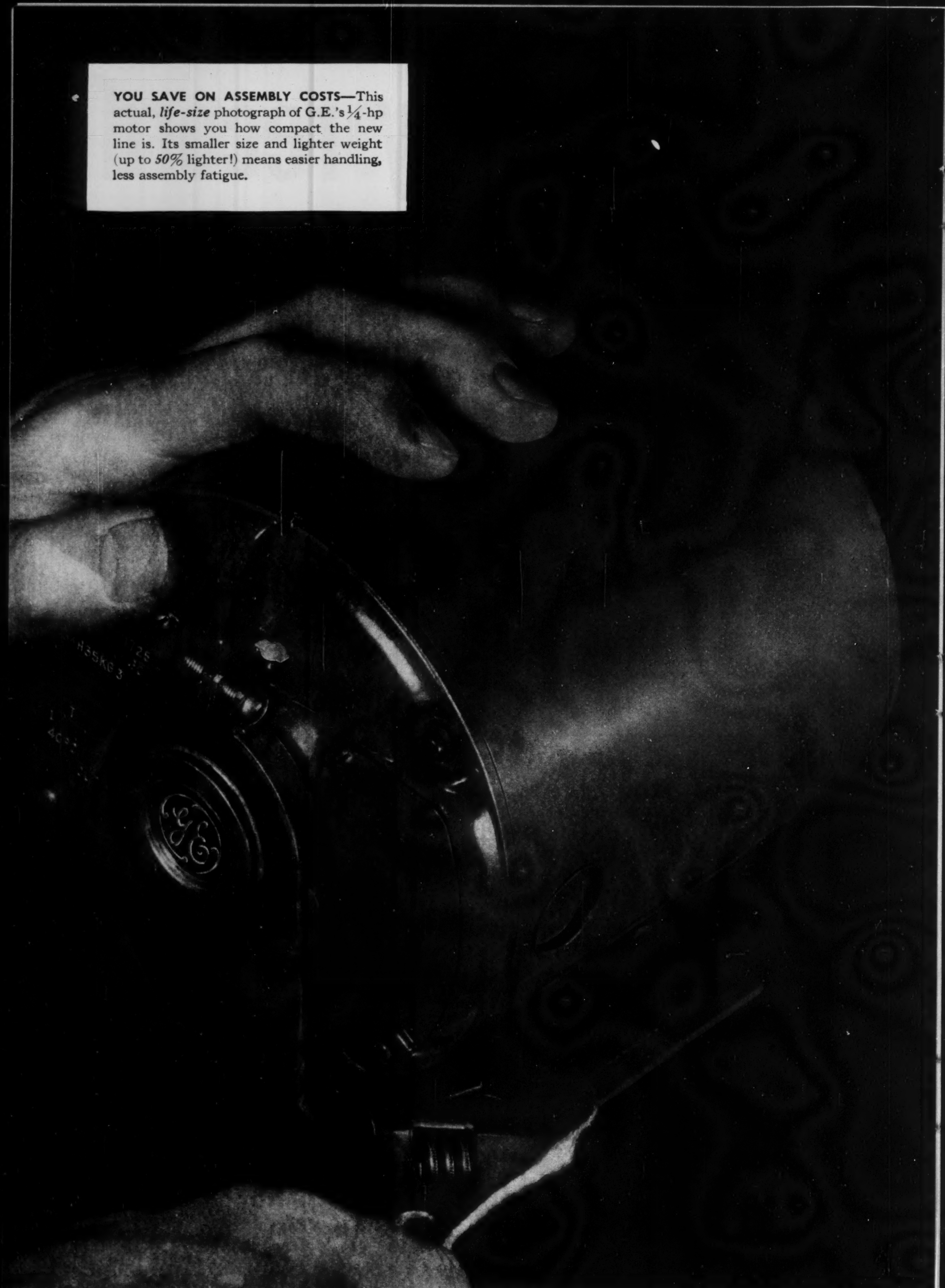


UniTrane room air conditioners give more year-'round comfort air conditioning for less money. Save space. Can save cost of central ventilation system.

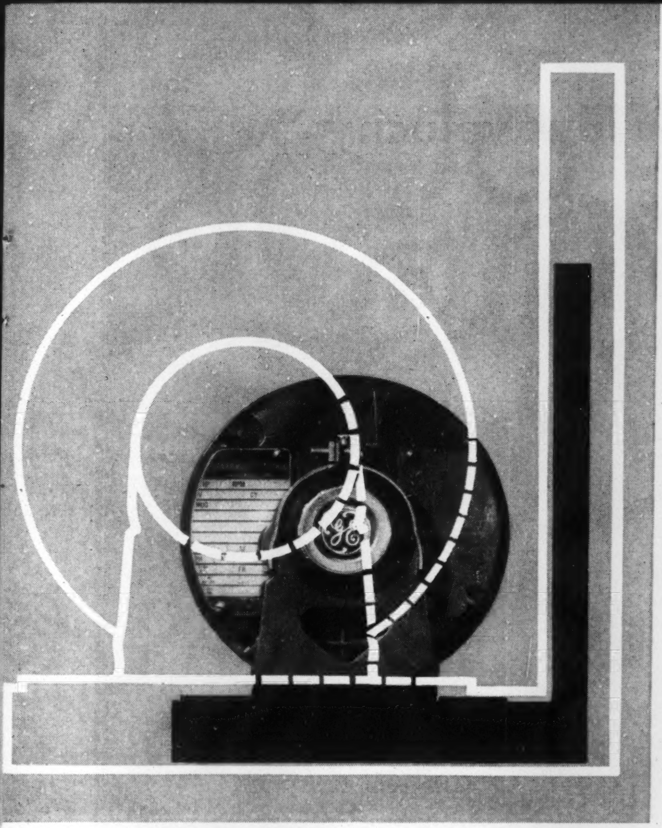
...one responsibility TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING AND VENTILATING EQUIPMENT

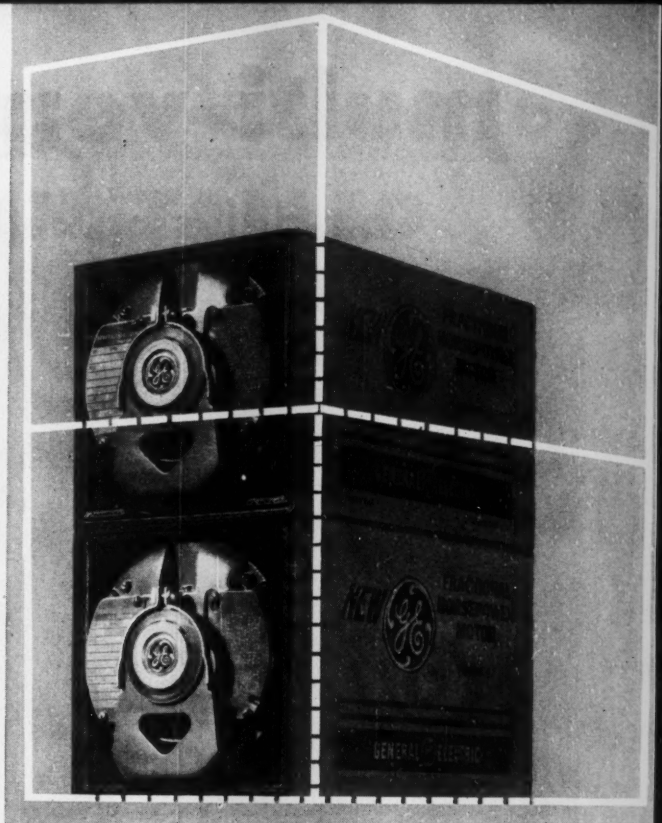
The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn. • Trane Co. of Canada, Ltd., Toronto • 87 U.S. and 14 Canadian Offices.



YOU SAVE ON ASSEMBLY COSTS—This actual, ***life-size*** photograph of G.E.'s 1/4-hp motor shows you how compact the new line is. Its smaller size and lighter weight (up to ***50%*** lighter!) means easier handling, less assembly fatigue.



YOU SAVE MATERIAL AND TRANSPORTATION COSTS—Smaller motor size cuts down on mounting space and materials, means lower transportation costs. Lighter weight means less material and lighter mountings. All this brings savings to you!



YOU SAVE VALUABLE WAREHOUSE SPACE—The new G-E ¼-hp motor actually requires 25% less storage space. Other G-E ratings save you as much as 40% in space required for motor stocks, bring you reductions in your material-handling costs.

You save 3 ways by specifying General Electric fhp motors

This general-purpose fhp motor—smaller, lighter, more versatile than ever before—is the basic motor for an entire new line. Oil-burner motors, jet and sump-pump motors, lawn-mower motors, fan and blower motors and others. The savings you get from this basic motor carry through the entire line.

HERE'S HOW YOU SAVE

1—ASSEMBLY COSTS—your assembly line people will find the all-new G-E motor much easier to handle, far faster to install. And "assembly fatigue" . . . caused by handling heavy components . . . will be cut drastically.

2—MATERIAL AND TRANSPORTATION COSTS—structurally lighter mountings can be used. And up to 50% saving in motor weight can cut down your shipping costs.

3—WAREHOUSE STOCKING COSTS. Smaller motor size permits better use of your valuable warehouse space and modern material handling equipment.

WIDER RANGE OF USE

Vastly improved insulation and lubrication system add to the range of your product's applications. The unique all-angle bearing design permits moderate thrust loads in any direction.

When you reorder fhp motors, ask your General Electric Sales Engineer to point out how these savings can benefit your business. Contact your nearby G-E Apparatus Sales Office, or write Section 702-9 for Bulletin GEA-5567. General Electric Company, Schenectady 5, New York.

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GENERAL ELECTRIC

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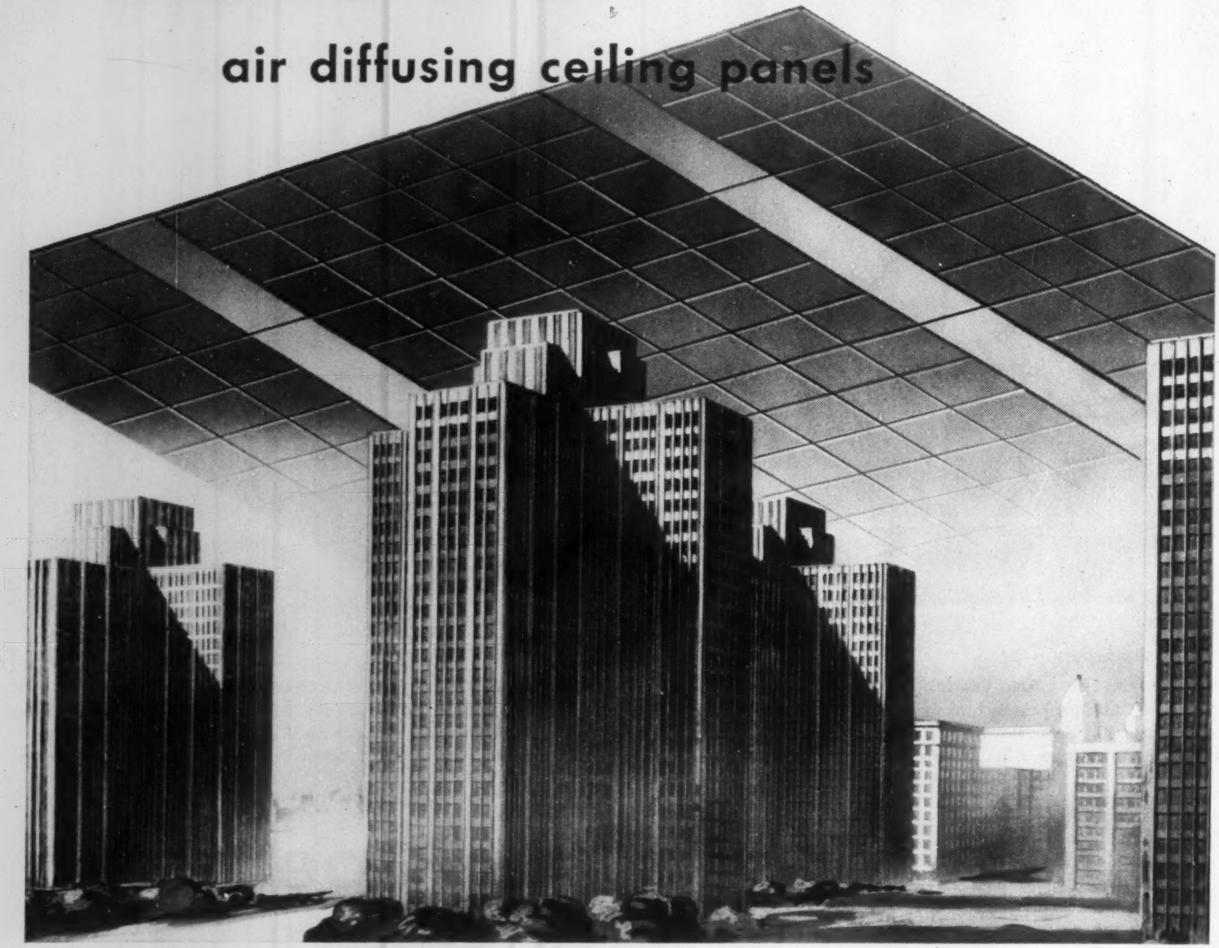

Eggers & Higgins, Architects • Irwin Clavan, Architect • Meyer, Strong & Jones, Consulting Engineers

in Pittsburgh's GATEWAY CENTER BUILDINGS

Out-of-sight Multi-Vent panels are installed behind the standard acoustical ceiling in all the interior bays of the first three office buildings.

Truly draftless, noiseless air conditioned comfort . . . for over 8000 office workers, summer and winter. Whether heating, cooling, or ventilating, Multi-Vent's gentle, pressure displacement air diffusion provides exceptional control and uniformity of room air motion and room temperatures.

Complete freedom in locating movable partitions. Partitions may even bisect a diffusing panel without disturbing in any way Multi-Vent's superior air flow pattern.

Complete freedom in location of lighting fixtures . . . for Multi-Vent panels are completely concealed in standard acoustical ceilings, and in no way interfere with interior design.

Radiant panel heating and cooling effect adds to the comfort factor. The large areas of the ceiling which function as distribution plates for Multi-Vent panels are heated or cooled to the temperature of the supply air.

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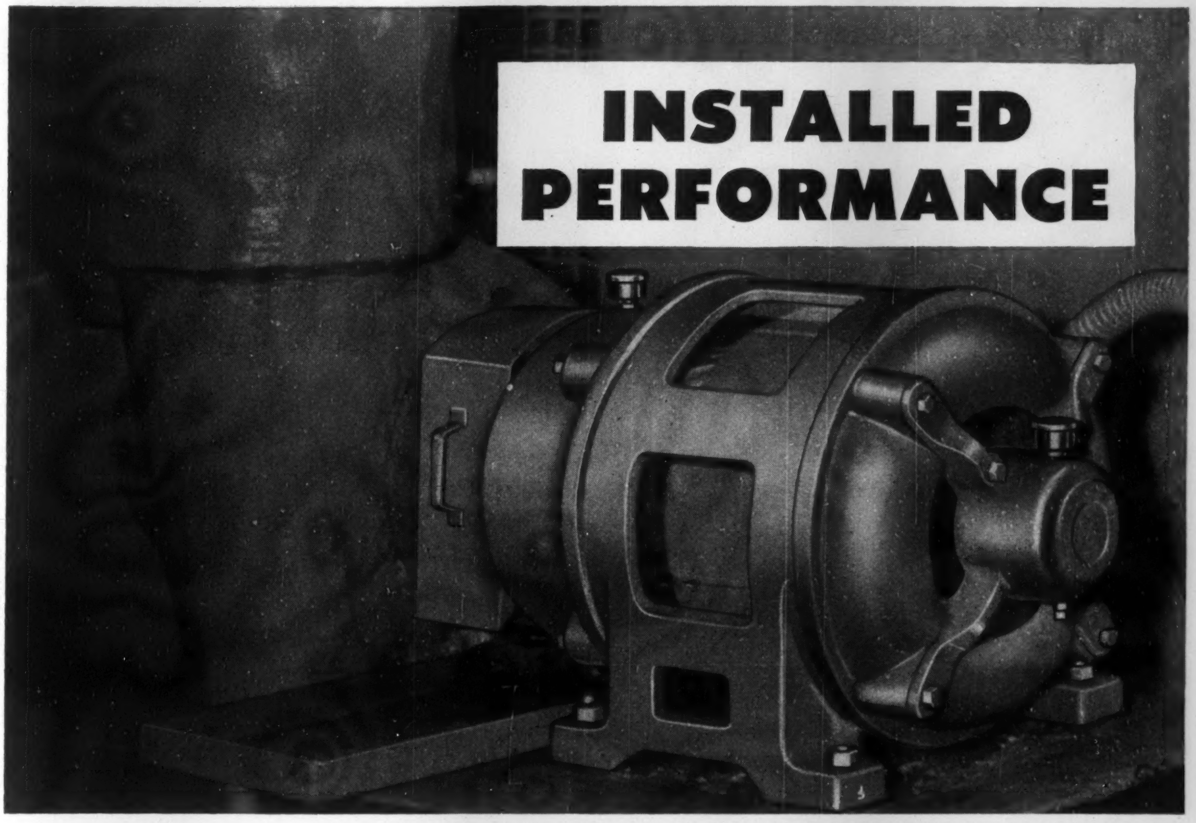


"Buffalo" Close-Coupled Pump Handling Chilled Water

—THAT MEETS (OR BEATS) RATED PERFORMANCE

RATINGS — "BUFFALO" CLOSE-COUPLED PUMPS — 1750 R. P. M.

TOTAL HEAD IN FEET

GPM		70	80	90	100	110	120	130	140	150
340	Size BHP	4CCM 7.90	3CCL 10.1	4CCL 10.9	4CCL 12.3	4CCL 13.7	4CCL 15.2	4CCL 16.9	4CCL 18.5	4CCL 19.8
360	Size BHP	3CCL [illegible]	3CCL [illegible]	4CCL [illegible]	4CCL [illegible]	4CCL [illegible]	4CCL [illegible]	4CCL [illegible]	4CCL [illegible]	4CCL [illegible]
380	Size BHP	3CCL 10.3	3CCL 11.6	4CCL 11.8	4CCL 13.3	4CCL 14.9	4CCL 16.5	4CCL 18.1	4CCL 19.8	4CCL 21.5
400	Size BHP	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	[illegible] [illegible]	4CCL 22.3
420	Size BHP	3CCL 11.8	3CCL 13.0	4CCL 12.9	4CCL 14.3	4CCL 16.0	4CCL 17.7	4CCL 19.4	4CCL 21.2	4CCL 22.7

Few disappointments are more aggravating — and expensive — than the pump that fails to deliver the performance promised on paper. It means adding an auxiliary unit or dismantling the installation to replace with a pump which will do the job.

This is why "Buffalo" Pumps are so frequently specified. Since "way back when", these pumps have had the reputation for living up to their ratings. Every "Buffalo" Pump is built to the standards of workmanship and materials required for its intended job — and every "Buffalo" Pump must pass a thorough load test, before it ever leaves the factory.

Take the popular "Buffalo" Close-Coupled Pump above. Heavily insulated-in for long periods of chilled water service, it delivers — and *keeps* delivering — up to rating. Husky and efficient, this compact pump is a long-term money saver. Write for Bulletin 975-D for the facts.

"Buffalo" PUMPS

BUFFALO PUMPS, INC.
171 MORTIMER ST. BUFFALO, N. Y.
Subsidiary of Buffalo Forge Company
Canada Pumps, Ltd., Kitchener, Ont. Sales Representatives in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

The ductwork insulation that goes on fast . . . takes less space!

Pittsburgh Superfine Fiber Glass insulation is so exceptionally rapid and easy to apply that users report labor costs have been substantially reduced.

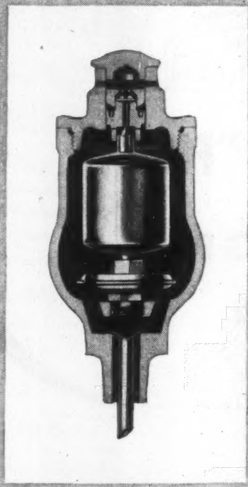
Quickly cut to shape by knife, shears or die, PPG Superfine is easily stapled, tacked or glued into place. And because it is composed of extremely fine filaments, it requires a lesser thickness of PPG Superfine to effectively insulate against heat, cold and noises than conventional coarse fiber glass insulation.

Check into these profitable features of Pittsburgh Superfine today. You'll find that there's a large variety of types and thicknesses, with or without aluminum, paper, cloth or vinyl facings available—in all standard roll widths, or slit widths. For complete information, write our executive offices or contact PPG district sales offices in Chicago, Cincinnati, Cleveland, Detroit, New York or Washington. Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.

FIBER GLASS **PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS**

PITTSBURGH PLATE GLASS COMPANY

A well placed air vent can work a heating miracle!



No. 5 Rapid Vent. Float and thermostatic construction. Designed for use at the end of steam mains, tops of risers and other similar locations on vapor and one pipe vacuum systems where the maximum venting requirement does not exceed one cubic foot per minute at 5 psi.

No. 6 Quick Vent. Thermostatic only. Designed for installation at high points in the piping where there is not sufficient room for the No. 5 Vent or where a float is not needed. Same venting capacity as No. 5.

In a Wilmette Illinois Building, an outwardly well-engineered vacuum system had been a headache for years. Then, last winter, along came a heating man who quickly sized up the situation and said with real conviction: "Put a Marsh No. 5 Vent right there!"

That did it! One inexpensive vent cleaned up a spotty, erratic condition, that a number of expensive alterations had failed to touch.

Unusual? Not in the least: over the years we have seen a lot of wonders worked by installing the right kind of Marsh air vent in the right spot. A number of these dependable vents are illustrated here . . . products that express an unrivaled accumulation of knowledge in dealing with air venting problems.

Marsh air vents are fully covered by the Marsh Heating Specialty Catalog along with Marsh Traps and Valves. Your local Marsh man will be glad to work with you in applying Marsh Vents effectively.

MARSH HEATING EQUIPMENT CO.
Sales Affiliate of Jas. P. Marsh Corporation
Dept. T, Skokie, Ill.

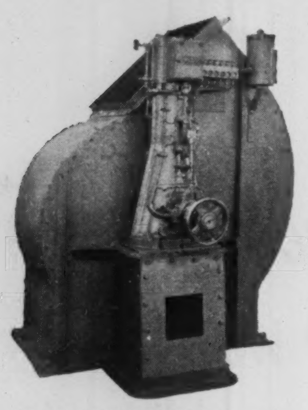
No. 50 Air Vent. Float only. Designed to remove air and gases automatically from hot or cold water tanks, coils or piping, liquid pump systems or similar applications where it is necessary to vent air rapidly. Maximum working pressure, 125 psi.

No. 55 Air Vent. Float and thermostatic construction. Is capable of expelling large volumes of air without passage of water or steam and is designed for use on steam pressure vessels or systems. Maximum working pressure, 125 psi.

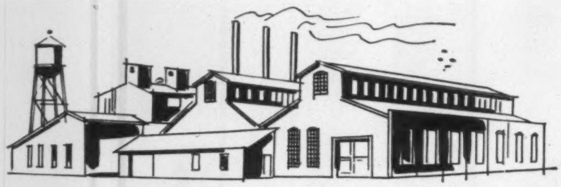
No. 7 Air Eliminator. Float and thermostatic construction. Expecially suitable for installation at the ends of steam mains, return piping and tops of risers where it is necessary to expel a large volume of air from the system. Suitable for working pressures up to 15 psi.

MARSH

Quality Heating Specialties since 1865



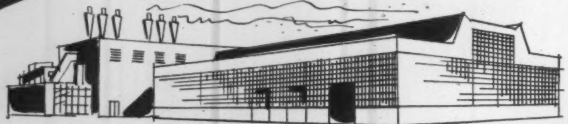
Early Model of BAYLEY Forward-Curve Steam Driven Fan.



Bayley Among The "FIRST"

IN FAN DESIGN

BACK IN 1914



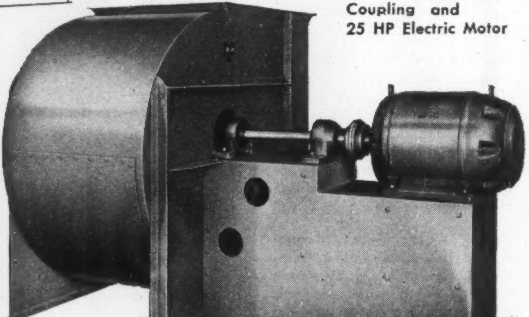
...IN 1954

OUT FRONT AS ALWAYS

IN AIR HANDLING

EQUIPMENT *Designed*

for Today's Faster Tempo...



Bayley 445 Aeroplex
Fan With Flexible
Coupling and
25 HP Electric Motor

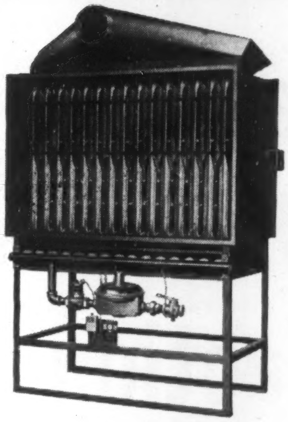
BACK IN 1914, the Bayley-designed forward-curve fan was a pioneer conception in efficient air handling. Its riveted and bolted housing was the sturdiest that could be fabricated with the construction techniques of the time. The Bayley-built vertical steam engine offered the best type of power for the low-speed fan drive.

Today the Bayley *backward-curve* fan represents the highest in efficient wheel design adapted to modern air handling demands. The Bayley Type AP Fan, above illustrated, with its all-welded housing and pedestal, is correctly designed and proportioned for the higher speed drives now available.

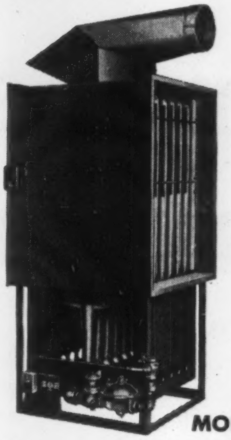
When installing fan equipment, be sure you get *all* the advantages of truly modern air handling methods. Consult the Bayley Engineering Department.

Bayley BLOWER COMPANY
6600 W. BURNHAM STREET • MILWAUKEE 14, WISCONSIN

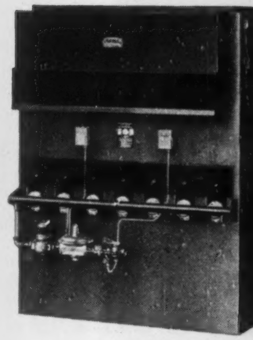
Designers and Manufacturers for Over 60 Years



MODEL SED-E



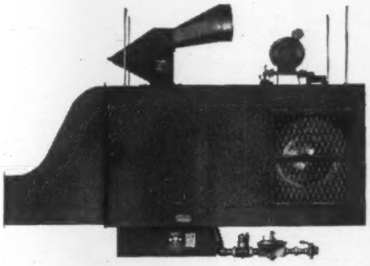
MODEL SED-S



MODEL SED-VF

MODEL SED-E — Non-corrosive type 321 stainless steel heat exchanger. Permits installation downstream of cooling equipment, for continuous blower operation. Air throughput in either direction. 80,000 to 600,000 Btu input.

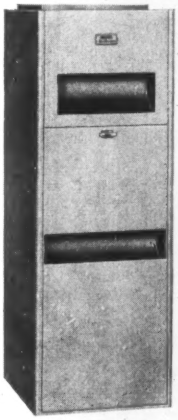
MODEL SED-S — Same as SED-E except controls are at the side, instead of at the end where accessibility requires either SED-E or SED-S is available in sizes from 80,000 to 600,000 Btu input in increments of 40,000 Btu.



MODEL SEU

MODEL SED-VF — Tested and approved as a duct furnace; type 321 stainless steel. Re-circulated or fresh air enters through bottom, sides, or back. Built in air bypass, vent in front. Sizes from 70,000 to 245,000 Btu input.

MODEL SEU — Suspended unit heater. Recirculates room air. Diffuser outlet with adjustable vertical and horizontal vanes. Double inlet forward curve blower. Continuous duty variable pitch drives, raised port burners.



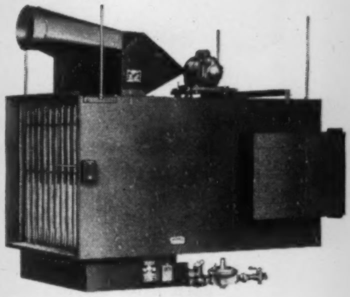
MODEL SEC

HAYES

FURNACES

outstanding for
commercial, industrial,
schools, churches,
theaters, large residential

HAYES FURNACE MFG. & SUPPLY CO.
2929 So. Fairfax Ave., Los Angeles 16, California
Telephone TExas 0-3734



MODEL SES

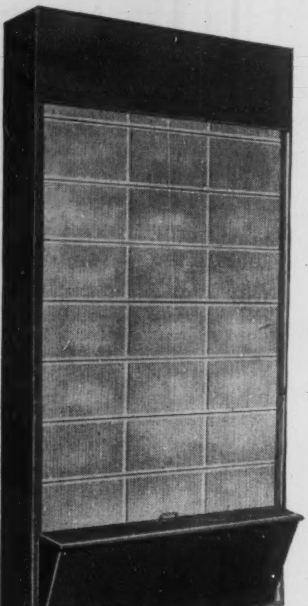
MODEL SEC — Forced air furnace. Stainless steel heat exchanger sections seam and arc welded. One piece cast iron burners with driller ports. Oversize double inlet blower glass or washable filters. 6 sizes — 70,000 to 245,000 Btu input.

REPRESENTATIVES

M. Blazer & Son, Passaic, New Jersey.
Blue Flame Supply Company, Atlanta, Georgia.
Eugene Bolstad, Edmonton, Alberta, Canada.
E. B. Bomar, Phoenix, Arizona.
Boyd Engineering Co., Albuquerque, New Mexico And El Paso, Texas.
Reube O. Emery, Nashville, Tennessee.
Hinkle Supply Company, Birmingham, Alabama.
Leudecke Engineering Co., Austin, Texas.
McCombs Supply Co., Denver, Colorado.
R. E. Meyers & Associates, New Orleans, Louisiana.
J. M. O'Connor Co., Wichita, Kansas.
O'Connor-Oklahoma Co., Oklahoma City and Tulsa, Oklahoma.
Smith Steam Specialty Co., Kansas City, Mo.
Tay-Holbrook, Inc., San Francisco, California.
F. R. Young, Houston, Texas.

MODEL SES—Forced air, suspended furnace for installation in suspended duct system. Inlet and outlet designed for sheet metal duct connection. Double inlet forward curved blower. Continuous duty variable pitch drives raised port burners.

New Automaze automatic air filter keeps itself cleaner with "pulse-type" action



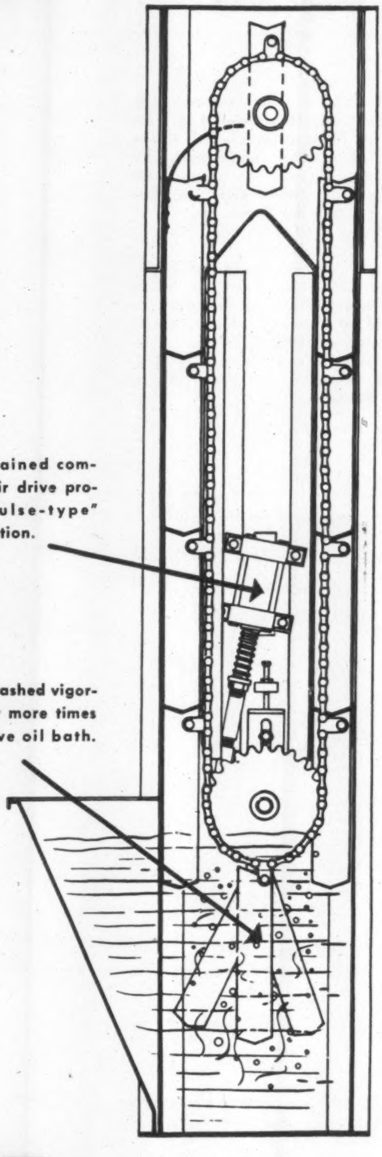
NOT ONLY does the new Automaze clean itself automatically but it keeps itself as clean as new because of its exclusive "pulse-type" action. While each panel in the revolving curtain is submerged in the cleaning tank at the bottom, it is agitated vigorously 6 or more times by a compressed air drive. This cleans each panel thoroughly, completely renews the adhesive.

Replacing stationary filters which may need cleaning once a month, the new Automaze goes 3 to 6 months without attention. And then all you need do is remove the sludge. A special reservoir cover makes this a quick, simple operation.

Filter panels two inches thick are linked in an air tight revolving curtain. Panels move up and over, like the cars on a ferris wheel. As a result, filter panels always keep the same face to the air stream. The dirty face of the filter is never on the downstream side. There's no possibility of dirt being blown off the filter into the cleaned air.

Here are a few other advantages that make Automaze today's biggest news in automatic air filtration: 1) Automaze has no electrical connections located in the air stream; 2) if desired, Automaze can be operated by remote control; 3) a variety of media designs are available to meet different filtering conditions; 4) when sections are bolted together, there's no need for rigid mechanical drive connections to cause alignment difficulties—each filter section contains its own drive mechanism.

You can get the full story from our new Automaze catalog. With over 29 years experience and thousands of different filter applications, Air-Maze, the filter engineers, are specialists in all types of air and liquid filtration. For help with your filter problems, contact your nearby Air-Maze representative or write The Air-Maze Corporation, 25000 Miles Rd., Cleveland 28, Ohio.



Self-contained compressed air drive provides "pulse-type" action.

Panel is washed vigorously 6 or more times in adhesive oil bath.

AIR FILTERS
SILENCERS
SPARK ARRESTERS

AIR-MAZE

The Filter Engineers

LIQUID FILTERS
OIL SEPARATORS
GREASE FILTERS

Here's what you've been looking for!

POWER ROOF VENTILATOR
CARNES

(Above Style Available in Sizes up to 36")

And . . . you'll find everything you want with Carnes Power Roof Ventilators. These heavy duty ventilators for all types of commercial and industrial installations are available in a large range of sizes — with duct sizes from 4" to 36" and capacities from 100 CFM to 17,600 CFM. Plus . . . quiet operation; easy installation; exhaust without back draft; extremely low in silhouette for attractive appearance; and longer lasting, economical service. Write today for complete information on the Carnes line. Get the best . . . Get Carnes!

. . . this all-aluminum power roof ventilator with the famous CARNES "know-how"

★ **LOW SILHOUETTE**

Carnes roof ventilators will not extend above the normal roof parapet — making a neat, attractive installation.

★ **AVAILABLE NOW**

Shipment of all sizes and all types of ventilators can be made without delay.

★ **COMPETITIVELY LOW-PRICED**

You'll be amazed at the price of Carnes Roof Ventilators. Prices are in line with those of ordinary ventilators.

★ **NON-SPARKING ALUMINUM FAN WHEELS**

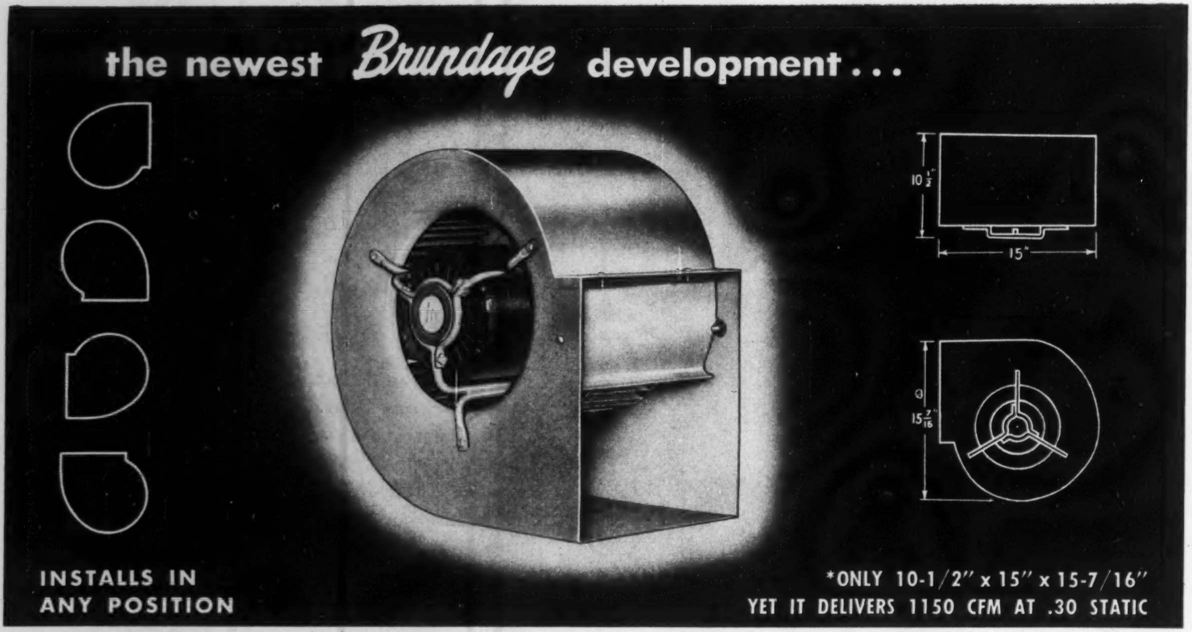
This important safety feature available as standard equipment at no extra cost. Available in both backwardly inclined centrifugal fan wheels and axial flow fans.

★ **ALL-ALUMINUM CONSTRUCTION**

For years and years of dependable, non-rusting service, and highest quality appearance.

CARNES The Most Talked About Name in Air Distribution

W. R. CARNES CO.   VERONA, WISCONSIN


the newest Brundage development . . .
10 1/2"
15"
15 7/16"
INSTALLS IN ANY POSITION
*ONLY 10-1/2" x 15" x 15-7/16"
YET IT DELIVERS 1150 CFM AT .30 STATIC

*Direct Drive Units in higher and lower capacities also available . . . information upon request.

THE *NEW* BRUNDAGE 9" DIRECT DRIVE BLOWER

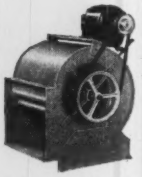
Here is one case where the biggest value comes in the smallest possible package. This new 9" Brundage Blower combines extremely high air handling capacity with a compactness and flexibility to make every cubic inch of equipment work to its fullest.

The internally mounted motor not only insures space economy and, by eliminating all belts and pulleys, it cuts the cost, ends a major maintenance problem . . . a design simplification that pays dividends in many, many years of superior service. To give you complete freedom of design, the 9" Brundage Blower may be furnished with mounting legs which allow you to place the unit in any convenient position . . . with full assurance of peak operating efficiency.

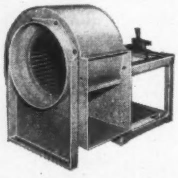
Test a Brundage 9" Blower in your own engineering department. Learn how Brundage design, construction and performance can add a new measure of quality to your products. We will be happy to provide everything you need to make a careful evaluation.

Ask about the Brundage production program. It is planned to simplify your inventory problems and free capital which might be tied up in blower stocks.

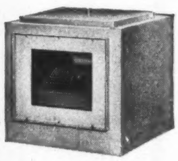
BLOWER-FILTER UNITS



BELT DRIVE BLOWERS



BLOWER EXHAUSTERS



SPECIAL BLOWER CABINET ASSEMBLIES

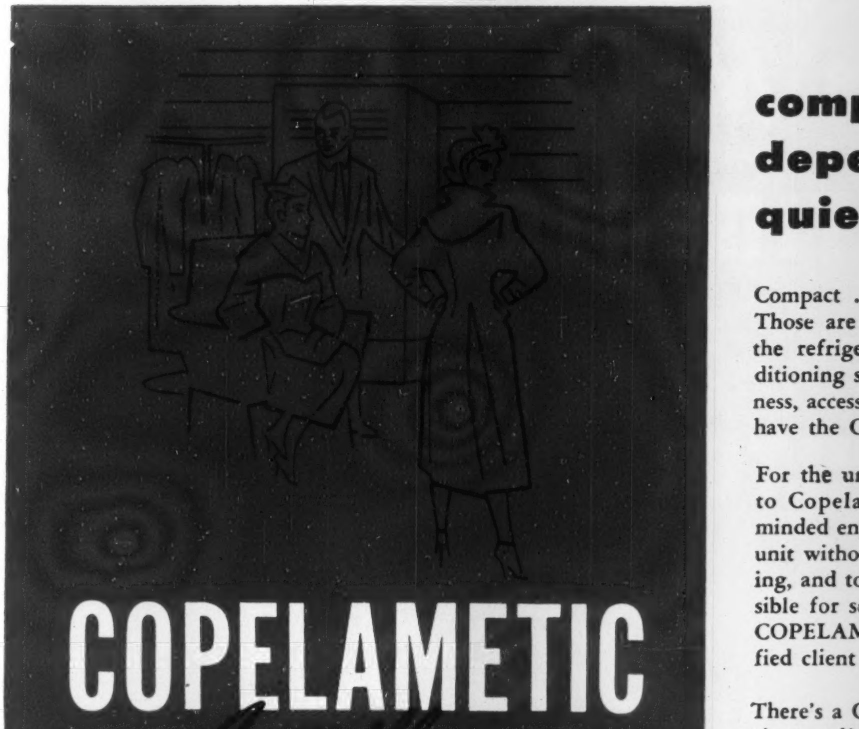
"INTEGRITY IS OUR TRADITION"

Brundage
COMPANY

PRODUCTS OF CHARACTER

503 NORTH PARK STREET
KALAMAZOO, MICHIGAN

We would like to have further data on:
Direct Drive Blowers ( )
Belt Drive Blowers ( )
NAME..
TITLE..
COMPANY..
ADDRESS..
CITY..STATE........................



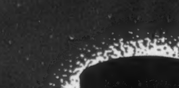
compact . . .
dependable . . .
quiet . . .

Compact . . . dependable . . . quiet. Those are the prime requirements for the refrigeration unit in any air conditioning system. Add to them ruggedness, accessibility and long life and you have the COPELAMETIC.

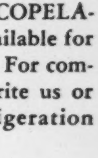
For the unit that has everything, look to Copeland the pioneer. Practical-minded engineers designed this modern unit without belts, seals or manual oiling, and to top that they made it accessible for servicing on the spot. Specify COPELAMETIC and be sure of a satisfied client for years to come.

There's a Copeland unit for every type air conditioning installation from smallest to largest. Air-cooled, remote COPELAMETICS are made from 1/4 thru 3 HP. There are water-cooled, remote units from 1/3 thru 7-1/2 HP. Self-contained COPELAMETICS are available for all applications. For complete details, write us or call your refrigeration dealer.

MODEL DE-100 ILLUSTRATED



Copeland
DEPENDABLE *Electric* REFRIGERATION

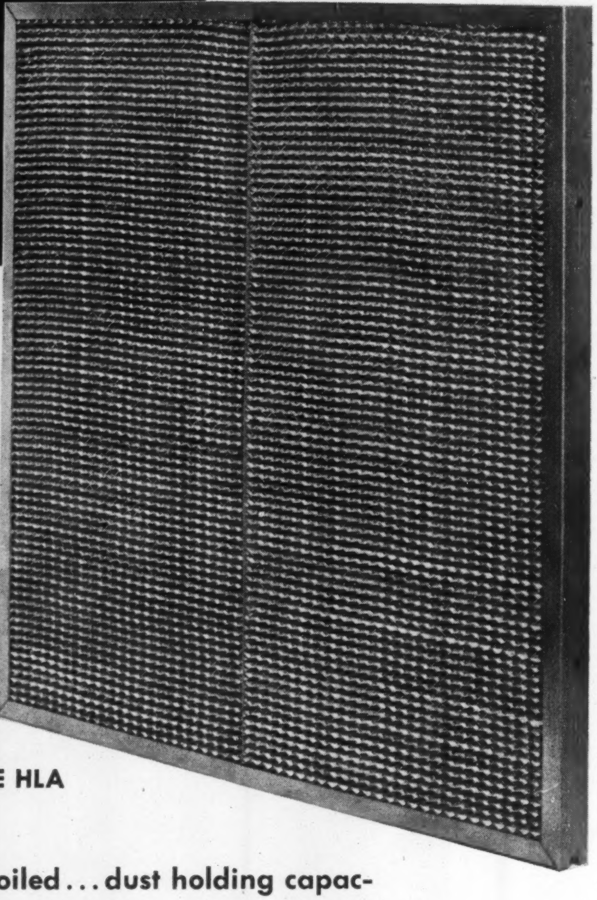


REFRIGERATION UNITS (OPEN · TYPE AND COPELAMETIC) WATER COOLERS

COPELAND REFRIGERATION CORPORATION · SIDNEY, OHIO

ANOTHER NEW CONTINENTAL

E-Z-Wash AIR FILTER



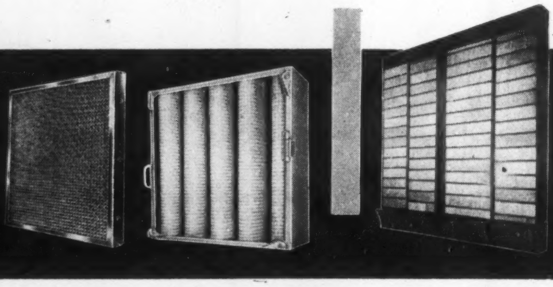
TYPE HLA

COMPACT...1″
HIGH EFFICIENCY
HIGH CAPACITY
PERMANENT TYPE

All aluminum . . . easily washed and reoiled . . . dust holding capacity exceeds that of usual 2″ throw-away filters . . . exceptional efficiency at either high or low velocity. Write for complete details.

P. O. BOX 1647 LOUISVILLE 1, KY.

CONTINENTAL AIR FILTERS Inc.



FIRST...AND ONLY

COMPLETE LINE OF HOT WATER HEATING PUMPS

Offering a range of heads and capacities which meet the circulation requirements of residences, apartment buildings, institutions, commercial and industrial buildings, regardless of size

FEATURING...

Water-tight Mechanical Seal
Pioneered by B & G, this Seal has a long record of failure-proof performance. The extremely hard material from which it is made and its method of assembly assure long, dependable service.

Oil lubricating system
Genuine protection against wear! Oil is carried up by wool wicking from a reservoir and continuously keeps the shaft and bearings in a bath of oil.

Super-finished, hardened shaft
The shaft is big—*oversized*—affording large bearing surfaces. A specially heat-treated integral collar prevents end-thrust—deadly enemy of seal and motor bearing life.

Quiet, spring-type coupler
The arms of the B & G Coupler are held together with springs—a design which dampens vibration and noise...so successfully it is used on all B & G Heating Pumps up to 25 H.P.

Special motors
Motors are either built in the B & G plant itself or to rigid specifications. B & G Boosters up to 1¼" have smaller than usual motors—but have exactly the same capacity as previously. This motor is the first specifically designed to match the reduced size of modern boilers.

Forced hot water heating systems have expanded in application to buildings of every size and function...B & G Boosters and Universal Pumps have likewise expanded to satisfy all possible circulation requirements.

These pumps are designed and built specifically for forced hot water heating systems. In every detail, they are constructed to assure three things: First, quietness of operation...second, dependable, trouble-free performance...third, long life.

How successfully B & G Pumps achieve these goals is evidenced by the fact that more are sold than all other hot water heating pumps combined! For full information send for the B & G Catalog.

BELL & GOSSETT
COMPANY
Dept. DI-5, Morton Grove, Illinois
Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

Nobody buys generators on the basis of voltage alone

Buying power roof exhausters on the basis of cubic feet per minute alone is just as ridiculous

When you buy a generator you want to know the wattage because it tells how much work can be performed against various resistances. The same is true of power roof exhausters, you should know how many CFM at a given static pressure because this is the *true* indication of actual performance.

Gallaher units with built-in scroll effect develop up to 4″ S.P., a figure unapproached by any other power roof exhauster. Performance data is the result of actual physical tests of the unit. Gallaher research indicates that unless scroll effect is present, efficiency against even normal static pressures are unlikely and that in actual test where ratings are predicted, instead of being physically tested, errors may run 50% or more.

It's the reason why so many engineers and architects are specifying Gallaher Air Vans® for almost every kind of industrial application where positive air removal is essential.

Gallaher Air-Vans®

Direct Drive (far left) develops up to 4″ S.P. 150 to 11,000 CFM. Belt Drive develops to 4″ S.P. 1,000 to 65,000 CFM.

Direct connected, low silhouette, weatherproof and extremely heavy construction.

For full information write

The GALLAHER Company

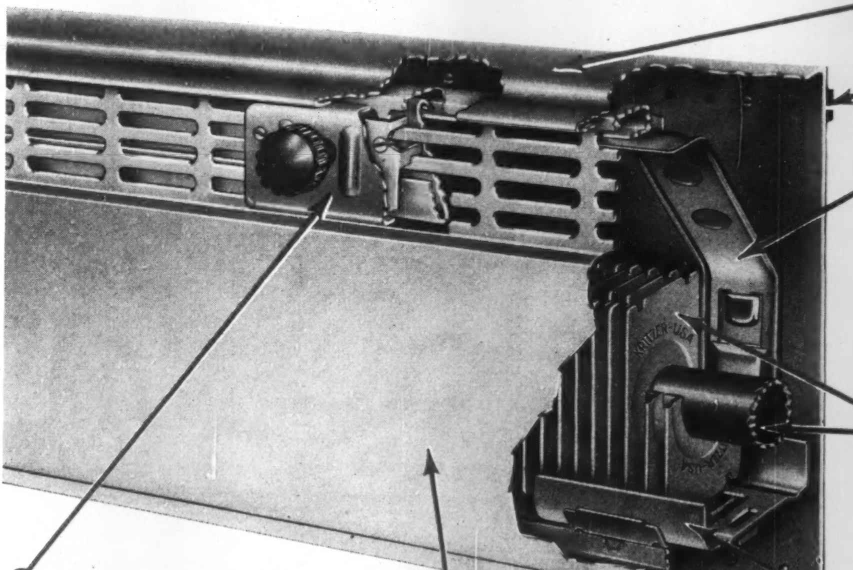
4108 Dodge St. Omaha, Nebraska

MANUFACTURERS OF POWER ROOF EXHAUSTER BASED ON DESIGN RESEARCH.

KRITZER Baseboard *has no secrets!*

Here, laid bare, is a section of Kritzer Baseboard. It reveals the reasons why it is more profitable for you and your customers to use Kritzer Radiation for houses, apartments, hotels, offices, hospitals, stores, or factories. It is quickly and easily installed with a minimum of time, tools and effort and is fully guaranteed for workmanship and materials.

Compare point-by-point with any other baseboard and you'll see why it is no secret that more Kritzer Baseboard is being specified and installed each day. For more information see your jobber or write for AIA File 30-C-44.



● Top and back plate are one. Prevents dust leaks and loss of heated air into walls.

● Thick felt strip is added insurance against dust streaks. Will not deteriorate.

● The new Kritzer Support Bracket (the only one of its kind on the market) snaps firmly onto the solid steel back plate. This provides accurate alignment, rigid support of all elements of the radiator *regardless of wall construction,* much quicker and easier installation, and NO TOOLS OR SCREWS ARE NEEDED FOR ATTACHMENT.

● Coils constructed with cold rolled fins mechanically bonded to cold drawn seamless pressure tube. Coils also constructed with aluminum or copper fins on copper tubing. Heating efficiency is assured, backed by the exclusive Kritzer Certified Ratings.

● Kritzer's new patented Damper and Control are very easily installed. The control can be placed at any point of a baseboard and damper run. There are no hinges to bind, no springs to wear out, no chains to break, no holes to drill. When snapped into place, two set screws lock it firmly in position.

● Made of heavy gauge steel, the front plate snaps into position completing the famous Kritzer Baseboard. No screws or tools necessary.

● Another Kritzer feature is the new Slide Cradle for coils. Fit snugly to the coil, the cradle rides smoothly on the ribbed Support Bracket. This insures quiet during any expansion or contraction of the coil.

KRITZER
RADIANT COILS, INC.

SEE YOUR JOBBER FOR KRITZER PRODUCTS

KRITZER BASEBOARD HEATING • KRITZER FIN-PIPE COILS
KRITZER RADIANT PANEL HEATING

2901 LAWRENCE AVE • CHICAGO 25

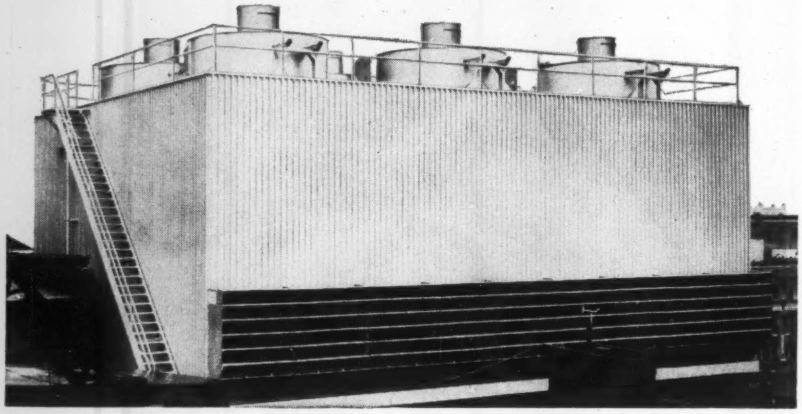
"IF IT'S KRITZER, IT'S RIGHT, SIR!"

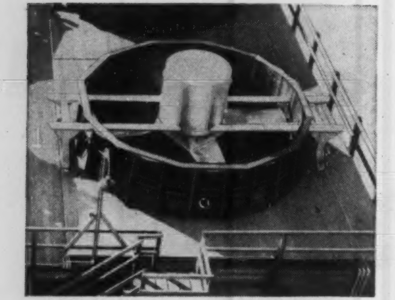
WHY ?

Why do hundreds of critical engineers and contractors choose Pritchard to help them solve their comfort cooling problems?

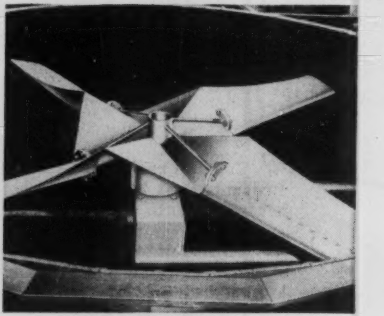
Right now, you probably don't have time to read all the reasons, so we've just pictured several of them for you. But, next time you want the right tower for a specific cooling job, contact Pritchard and find out the rest of the reasons why.

Your Pritchard representative is listed in the classified section of the telephone directory, or you can write direct to the address given below.

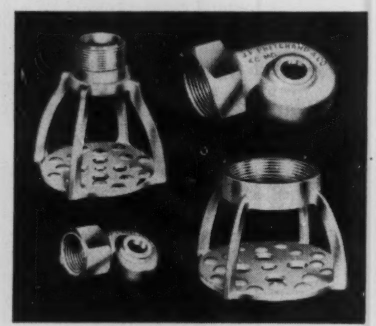




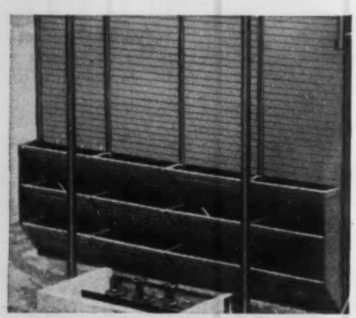
PATENTED FAN DRIVES
Self-ventilated, fully encased, completely integrated assembly.



EXCLUSIVE FANS
Designed especially for cooling tower service, superior efficiency at low horsepower, another patented exclusive.



MORE EFFICIENT DISTRIBUTORS
Patented low-pressure design for better spray, more efficient cooling.



ICING-CONTROL LOUVERS
Minimizes problems of winter operation, entirely factory assembled, patented.

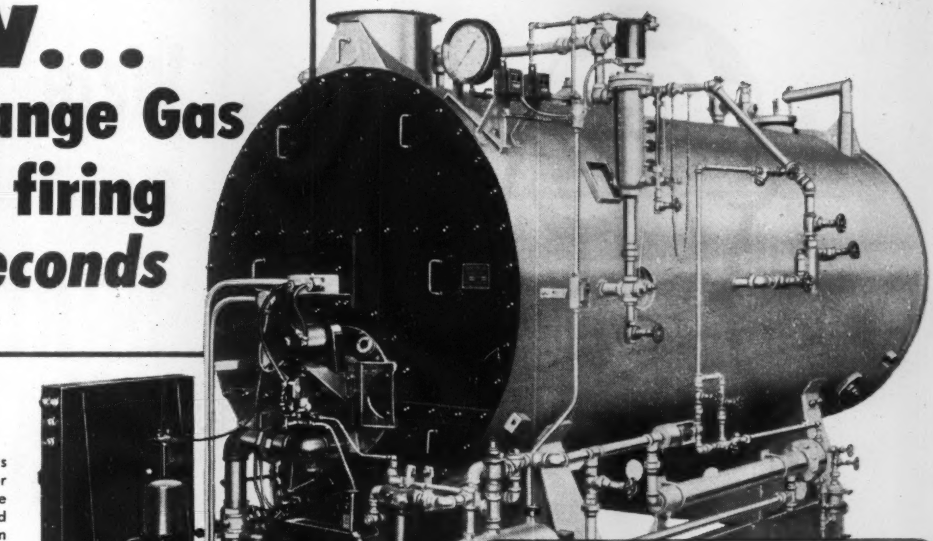
Industry's Partner for Progress

J. F. Pritchard Co.
OF CALIFORNIA
A DIVISION OF J. F. PRITCHARD & CO.
Dept. 360, 210 West 10th St., Kansas City 5, Mo.

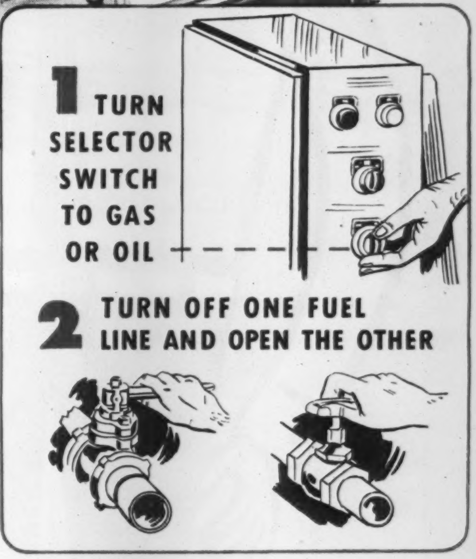
COOLING TOWERS
SPECIALIZED HEAT EXCHANGERS
GAS & AIR TREATING EQUIPMENT

Representatives in Principal Cities from Coast to Coast

NOW... interchange Gas and Oil firing in *10 seconds*



Modern Cleaver-Brooks Model LR Steam Boiler Equipped with Exclusive Cleaver-Brooks "10-second conversion" Combination GAS and/or OIL Burner


1 TURN SELECTOR SWITCH TO GAS OR OIL
2 TURN OFF ONE FUEL LINE AND OPEN THE OTHER

TWO, simple motions eliminate time-consuming change-over

Now you can use oil or gas at the flick of a switch! This exclusive new Cleaver-Brooks development permits changeover from oil to gas or vice versa in only 10 seconds.

That's because the Cleaver-Brooks Combination Gas and/or Oil Fired Boiler operates on gas *with the oil burner in place.* Simply flipping a selector switch on the control panel to either gas *or* oil sets the proper circuit in action. Turning the convenient fuel supply valves completes the entire changeover — and in 10 seconds or less!

To gas users in all parts of the country — and in particular areas where local requirements demand immediate changeover — this exceptional fuel flexibility can be an important factor in determining your overall operating economy.

Ten-second conversion, like 4-pass construction, self-contained design, guaranteed 80% efficiency when firing with oil, is another "plus" feature pioneered by Cleaver-Brooks. It demonstrates Cleaver-Brooks' continuing effort to bring steam users even greater flexibility and reduced operating costs.

If you are considering simplifying your present boiler plant, remember Cleaver-Brooks Combination GAS and/or OIL Fired Boilers. Sizes 15 to 500 h.p. — 15 to 250 p.s.i. Write for complete facts.

Cleaver-Brooks

Originators of the Self-Contained Steam Boiler

CLEAVER-BROOKS COMPANY
Dept. C-312 E. Keefe Ave., Milwaukee 12, Wis., U.S.A.
Cable Address: Clebro-Milwaukeewis
Builders of Equipment for the Generation and Utilization of Heat • Steam Boilers • Oil and Bitumen Tank-Car Heaters • Distillation Equipment • Oil and Gas-Fired Conversion Burners

We're a "SHIRT-SLEEVE" Outfit!

From our top executives right down the line, we're always available to give personal service to the needs of any customer, large or small. We pride ourselves on the dispatch with which we get things done without red tape.

Wholesalers all over the country, tell us this personal service by the "top brass" is one of the main reasons why they like to do business with Reading. They've found that Reading's "shirt-sleeve" service means they can always depend on getting fast delivery of the type and size tube they want in the quantity they need. This streamlined service, plus uniform high quality second to none in the industry, has led to a growing preference for Reading Copper Tube.

READING TUBE CORPORATION
EMPIRE STATE BUILDING, NEW YORK 1, N. Y.

Depots
- Reading, Pa.
- Woodside, L. I., N. Y., 57-15 Northern Blvd.
- Chicago, Ill., 724 W. 50th St.
- Houston, Texas, 1121 Rothwell St.
- Atlanta, Ga., 690 Murphy Ave., S.W. Unit 5, Bldg. B

READING COPPER TUBE

Sold Through Wholesalers Only

OUT OF SIGHT—OUT OF MIND—

Conduit containing 10 pipes in typical installation. Contains no joints, no voids. Z-Crete is as permanent as the earth itself!

Permanently!

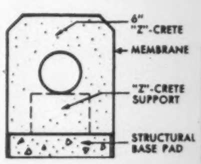
...when underground heated piping is insulated with "Z"crete®

Only Z-Crete, the Modern Monolithic Insulation, Makes It Possible to Insulate a Job and Forget It!

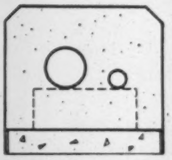
Z-Crete, the lightweight, resilient, insulating concrete specially designed for underground heated piping *you can install and forget!* It's as permanent as the earth itself.

Z-Crete's stability and high water resistance make it a good protector against pipe corrosion, as well as an excellent insulator. It is poured directly and monolithically around the piping, eliminating joints or voids. Fireproof, rotproof and verminproof, Z-Crete serves a dual purpose—the insulating concrete is both the structural conduit and the insulation. Any number, size, or arrangement of pipes can be designed into a Z-Crete conduit. Inquire today . . . there's an experienced, licensed applicator near you!

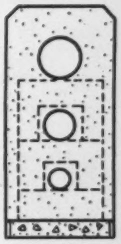
USE Z-CRETE FOR ANY HEATED UNDERGROUND SYSTEM



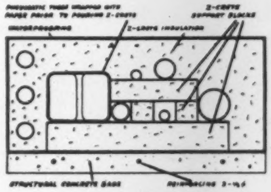
SINGLE PIPE CONDUIT



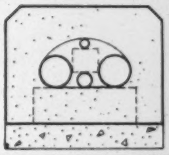
TWO PIPE CONDUIT



PIPE OVER PIPE



MULTIPLE PIPE CONDUIT



MULTIPLE PIPE CONDUIT WITH STEAM TRACER

"Z"crete®

DIVISION

ZONOLITE COMPANY

135 South La Salle Street • Chicago 3, Illinois

Z-Crete is furnished and installed only by licensed applicators of Zonolite Company under U. S. Patent No. 2355966—Canadian Patent No. 439356.

Write for **FREE** *Booklet*

Z-CRETE DIVISION,
ZONOLITE COMPANY
Dept. HP&AC-34
135 S. LaSalle St.,
Chicago 3, Ill.
Please rush FREE Z-Crete Booklet with full details and specifications about this easier, better insulation for underground heated piping.

Name...
Company...
Address...
City................Zone......State.........

TOOTH P
CHEW
WIGLEY'S
CHEW'N GUM
Where there's smoke
there's an
EL ROPO

In a pinch it's a cinch ...with MICROLITE

Ducts get into the darnedest places. But so does Microlite glass fiber insulating wool! Microlite is so soft and compressible and lightweight it can be wrapped easily around any shape or system—in the hardest-to-get-to locations. Clings like the proverbial vine. Is so tough it doesn't have to be babied. Doesn't itch. Cuts easily with knife or scissors. Can be quickly fastened by adhesion or stapling. And on top of all that, inch for inch Microlite is one of the most effective of all insulating materials from sub-zero to 400° F. For folder and samples write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

MICROLITE *is an excellent absorber of sound* • **MICROLITE** *is inorganic, resists fire and moisture*
MICROLITE *is fungus-and-bacteria proof* • **MICROLITE** *is shipped in space-saving rolls compressed 4-to-1*

VITRON Glass Textile Yarns • Rovings • Micro-Fibers
DURAMAT Vapor Barriers • **BLUE FLAG** Pipe Wrap
MICROLITE Thermal and Acoustical Insulation
VIBRAGLASS Mounting and Packaging Materials
COUSTIC-AIRE and **THERMO-JET** Aircraft Insulations

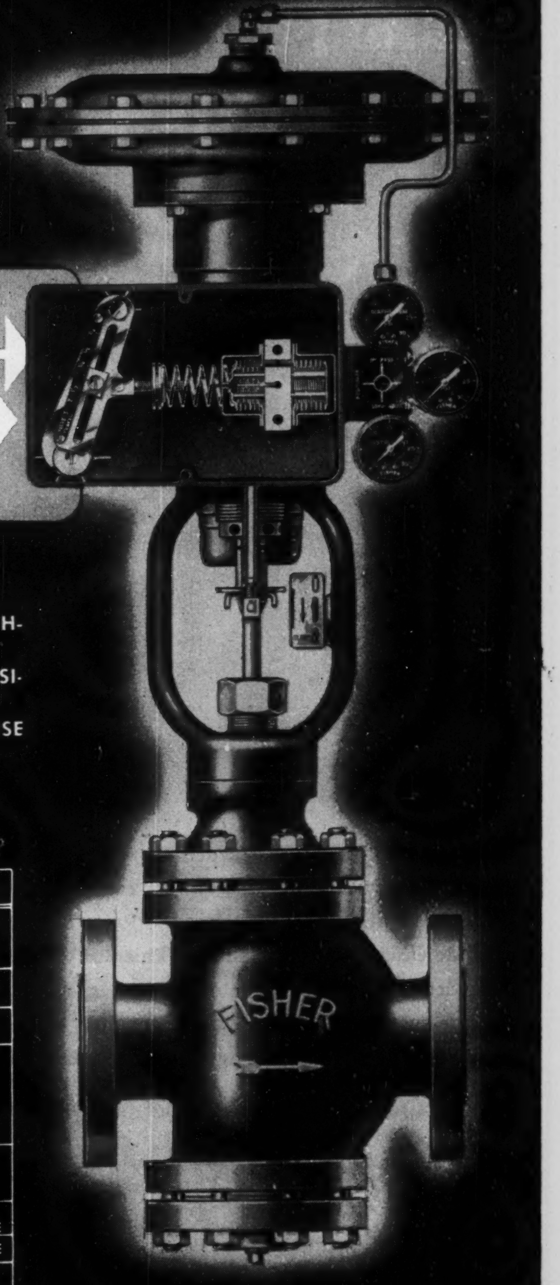
GLASS FIBERS *INC.*

Makers of glass fibers by the ELECTRONIC—EXTRUSION process ... developed, patented and used exclusively by Glass Fibers Inc.

FISHER®

POSITROL®

FOR ACCURATE POSITIVE VALVE POSITIONING



FEATURES

- COMPACT — SIMPLE RUGGED
- 5 YEARS FIELD SERVICE
- EASILY ADJUSTABLE
- FORCE BALANCE TYPE OF POSITIONER
- AVAILABLE WITH OR WITHOUT BY-PASS
- USABLE AS REMOTE POSITION INDICATOR
- FOR DIRECT OR REVERSE ACTION VALVES

TECHNICAL DATA

TEST			FISHER TYPE 3500
INSTRUMENT PRESSURE SENSITIVITY CONTROLLING PRESSURE CHANGE NEEDED TO PRODUCE 2 LBS. TO 15 LBS. TO DIAPHRAGM			0.07 LB.
STEM MOVEMENT SENSITIVITY AMOUNT STEM CHANGE TO PRODUCE 2 LBS. TO 15 LBS. TO DIAPHRAGM	½" TRAVEL		0.0037" AVE.
	2" TRAVEL		0.015" AVE.
SPEED TIME IN SECONDS FOR FULL TRAVEL	SIZE	TRAVEL	
	DD	¾"	1.2 — 1.2 SEC.
	FF	1½"	4.2 TO 4.8 SEC.
	GG	2"	7.2 SPC TO 9.6 SEC.
	HH	2"	10.5 TO 12.6 SEC.
LAG ERROR IN POSITION AT 9 LBS. CONTROLLER PRESSURE	½" TRAVEL		0.0006" AVE.
	2" TRAVEL		0.001" AVE.
EFFECT OF VARIATIONS IN AIR SUPPLY PRESSURE	½" TRAVEL		0.1 LB. PER 5 LB. CHANGE
	2" TRAVEL		0.1 LB. PER 5 LB. CHANGE
CHARACTERISTICS CONTROLLED P VS DIAPHRAGM P			LINEAR
COMMENTS			STABLE ADJUSTMENTS ALL EASY AND SIMPLE
AIR CONSUMPTION NORMAL 9 LBS. DIAPHRAGM PRESSURE			15.0 CU FT/HR

FOR COMPLETE DETAILS WRITE FOR BULLETIN E-3500.

FISHER
GOVERNOR COMPANY
Marshalltown, Iowa

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE CONTROL

Since 1880

When you Compare Air Filters . . .

FEEL
THE FILTER
PACK!
Glasfloss

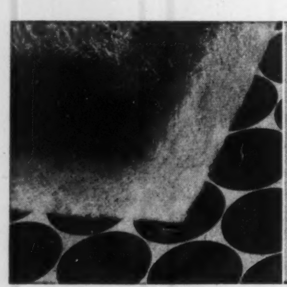
The soft, silky glass fibres are easy on the hands—and really stop Dust! The *magnified* view of the Glasfloss filter pack above shows why the long, fine curly fibres provide efficient filtering action. This fluffy, resilient mass provides an intricate maze of air passages with a greater surface area to catch and hold more dust throughout the entire pack. RESULT: Longer life, less changes, lower cost.

Glasfloss **DISPOSABLE AIR FILTERS**

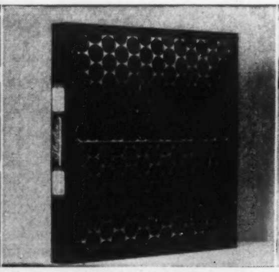
- Hold more dust at higher efficiency
- Less resistance to the passage of air
- Insure greater air capacities
- Easier to handle during installation and removal
- Tough and resilient
- Highly fire resistant
- Moisture-proof

Glasfloss
**MAKES A COMPLETE
LINE OF
DISPOSABLE
AIR FILTERS**

**Descriptive literature on request—
Address Dept. HP-1**



GLASFLOSS I-S
for heavy industrial use



GLASFLOSS STANDARD
the all-purpose filter

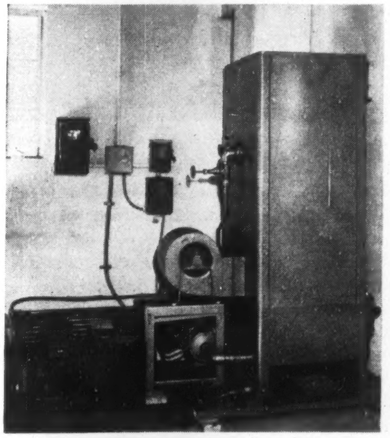
GLASFLOSS ROLL-PAK
for economical bulk use

Glasfloss 155 EAST 44th STREET, NEW YORK 17, N. Y.

COMPACT COOLING TOWERS OF GROWING IMPORTANCE IN RESIDENTIAL COOLING

Market surveys reveal that the sale of room air conditioners for homes has increased by 600% since 1947. In 1952, total sales of both cabinet and window types for homes was 251,000 units. Substantial gains were registered in 1952 and the 1953 figures are expected to surpass 500,000 units. It is expected that the trend will swing to built-in central cooling system. Residential air conditioning, which originally "caught on" in volume in the Southwest is rapidly moving North and East in popularity...and promises to be an even bigger market in 1954.

To meet the need for adequate cooling towers for "built-in" residential air conditioning installations, the Binks Manufacturing Co. has introduced an *extra quiet* unit which can be located in the basement, garage or yard. This compact cooling tower is Model B-23-B. It is designed specifically for home use, is furnished complete with a small circulating pump. It is blower driven by a single motor. This is suitable for loads from two to three tons commonly offered to the consumer market.

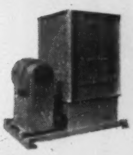


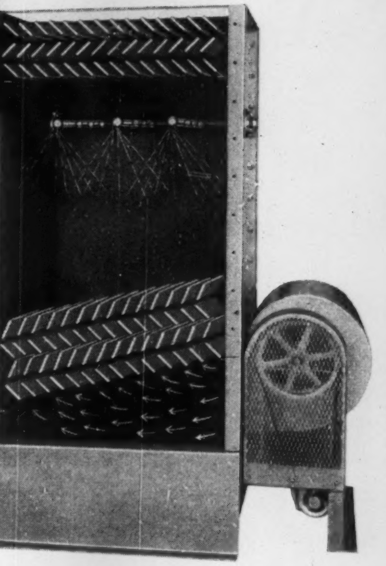
Full information on this specially-designed, moderately-priced unit may be obtained by writing direct to the manufacturer, Binks Manufacturing Company, 3118-38 Carroll Ave., Chicago, Ill. Ask for Bulletin 47-C. The new unit is now in production.

Achieve maximum cooling
WITHOUT NOISE!

QUIET
Does Not Disturb!

Binks
SERIES 3-B
Cooling Tower





- Only dry air passes through the air propulsion assembly. This reduces corrosion and maintenance.
- Non-clogging ROTOJET nozzles produce maximum cooling. The whirl chamber causes fine fluid break-up.
- Air current moves up in opposite direction to downward water flow, thereby accelerating the cooling rate and volume.

For use indoors or out, a Binks *blower-type* cooling tower provides the cooling efficiency you want—*plus* easy, *low-cost maintenance*... and smooth, *silent*, dependable operation. A Binks type 3-B tower is *extra quiet* because its squirrel-cage blowers provide ample air movement while running at slow speeds.

Binks spray-deck construction steps up cooling efficiency by "filming" the water to expose more surface to the cooling air. This assures maximum heat transfer. *Controlled* air movement through the tower makes it independent of natural breeze.

You pay no more for this extra performance when compared with other equipment of similar size.

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED ☎ DIRECTORY

SEND TODAY for these bulletins:
No. 47-A—Type 2-B (3 to 30 tons);
No. 47-B—Type 3-B (1 to 108 tons);
No. 47-C—Type B-23-B (2 to 3 tons).

Binks
EVERYTHING FOR WATER COOLING

MAIL COUPON TODAY!

Binks Manufacturing Company,
3118-38 Carroll Ave., Chicago 12, Ill.

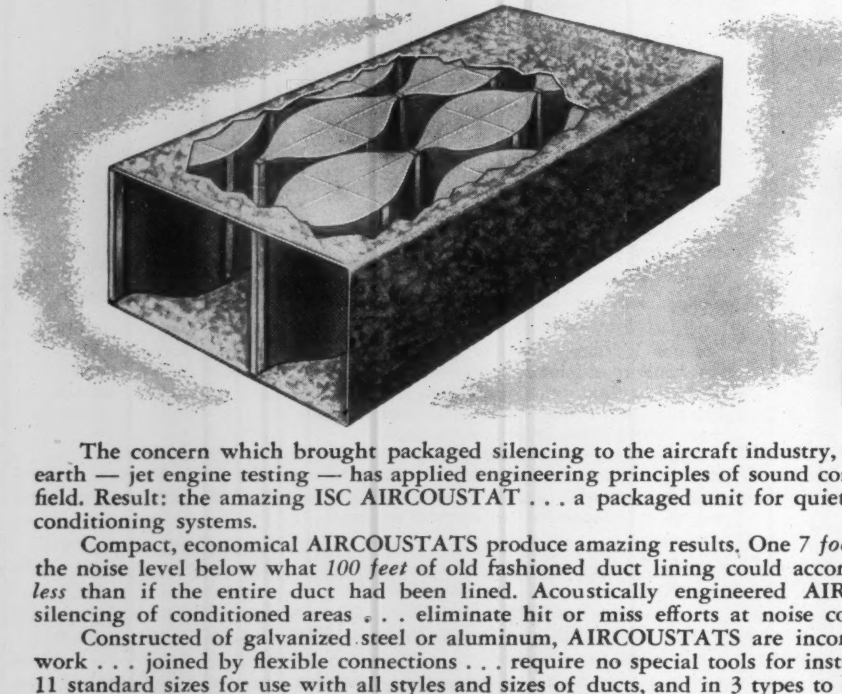
Gentlemen: Please rush FREE Cooling Tower Bulletins as checked:

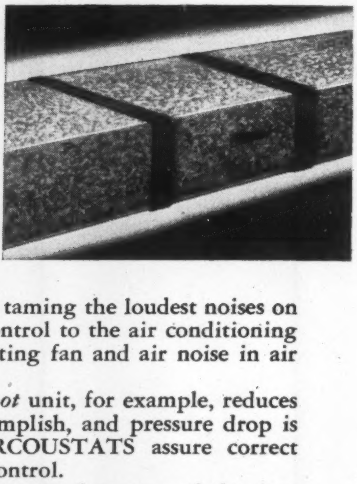
☐ Bulletin 47-A ☐ Bulletin 47-B ☐ Bulletin 47-C

NAME____________________
COMPANY____________________
ADDRESS____________________
CITY________ ZONE________ STATE________

NEW *Aircoustat* BRINGS PACKAGED SILENCING TO AIR CONDITIONING SYSTEMS.....

One 7 foot unit more effective than 100 feet of duct lining





The concern which brought packaged silencing to the aircraft industry, taming the loudest noises on earth — jet engine testing — has applied engineering principles of sound control to the air conditioning field. Result: the amazing ISC AIRCOUSTAT . . . a packaged unit for quieting fan and air noise in air conditioning systems.

Compact, economical AIRCOUSTATS produce amazing results. One 7 *foot* unit, for example, reduces the noise level below what *100 feet* of old fashioned duct lining could accomplish, and pressure drop is *less* than if the entire duct had been lined. Acoustically engineered AIRCOUSTATS assure correct silencing of conditioned areas . . . eliminate hit or miss efforts at noise control.

Constructed of galvanized steel or aluminum, AIRCOUSTATS are incorporated as part of the duct work . . . joined by flexible connections . . . require no special tools for installing. They are available in 11 standard sizes for use with all styles and sizes of ducts, and in 3 types to meet any desired conditions.

Selection is no problem with AIRCOUSTAT. If it fits geometrically, it fits acoustically.

Write TODAY for complete information.

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

Industrial Sound Control
45 Granby Street, Hartford 12, Conn.
Please send me more information
on AIRCOUSTATS:

Name ....

Address ....

City ....Zone ....State ....

What's this about a Bank Fence and a Boiler?

Union Bank of Kinderhook, H. B. Smith fence — 1859

National Union Bank of Kinderhook, same fence — 1954

A true story — with a moral for the boiler specifier

Now flourishing as the National Union Bank, the Union Bank of Kinderhook, N. Y., was founded in 1853, the year in which the H. B. Smith Company was established.

Six years later, H. B. Smith journeyed from Westfield to Kinderhook to lay before the Bank Directors a proposal: to furnish an elegant new cast iron fence to enclose the grounds of the banking building. Good salesman as always, H. B. came back with the order and the fence was speedily erected.

Today, visitors to Kinderhook are still impressed with the decorative appearance of this fence. Ninety-four years of constant exposure to all kinds of weather have done little to wear the sturdy gray iron castings from H. B. Smith's foundry.

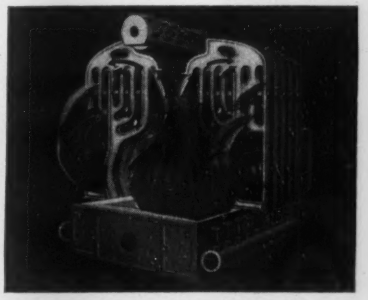
Does this tale hold a moral for the boiler specifier? We think it does!

As used in H. B. Smith boilers, cast iron is an enduring material, highly resistant to corrosive acidic gases, and virtually indestructible except through human neglect or positive mistreatment. It has the qualities of controlled chemical uniformity, adaptability to intricate coring, and rapid and thorough heat absorption.

It is not unusual to find H. B. Smith boilers which have given uninterrupted service for 50 or 60 years and to which sections have been added as the need for greater heating loads has arisen. Thousands have been converted and reconverted to the use of various fuels as economy or supply made one or another more advisable. We know of one installation which has been in continuous use since 1884 — 70 years of service — with the only maintenance cost the replacement of grate bars, doors or other minor trim items.

Your customers are looking to you to provide a boiler with these qualities; you can recommend nothing better than an H. B. Smith.

World's Broadest Line of Cast Iron Boilers for Heating and Domestic Hot Water



Note how more boiler heating surface and longer flue travel exact full benefit from fuel. Tall chimneys and induced draft mechanisms are not necessary with efficient Smith-Mills boilers.

H.B. Smith CAST IRON BOILERS

THE H. B. SMITH COMPANY, INC., WESTFIELD, MASSACHUSETTS

Established 1853

AIR CONDITIONED STOCKINGS under Taylor Control!

AIR CONDITIONING plays an important part in the manufacture of the high quality full fashion hose for which Bossong Hosiery Mills, Inc., have such a fine reputation. At their Asheboro, North Carolina plant they rely on a Taylor controlled Buensod-Stacey air conditioning system to maintain just the right operating conditions.

"The hosiery business is highly competitive today," says Mr. P. W. Redding, Bossong Plant Engineer, "and it's very important that an air conditioning system meets our exacting requirements and is economical to operate. Top quality controls are essential to do this."

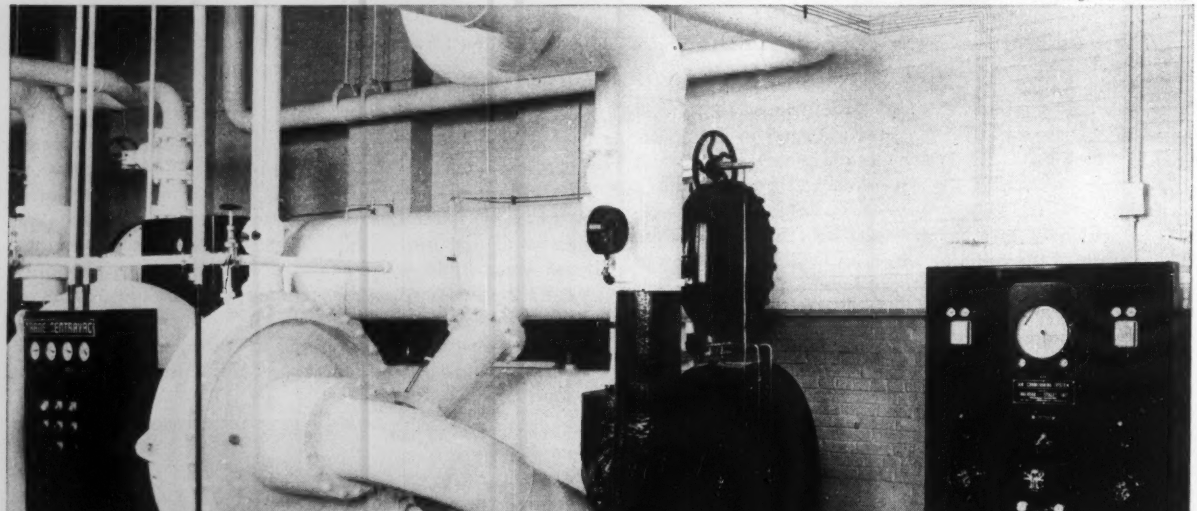
The Taylor FULSCOPE* Recording Temperature Controller with adjustable sensitivity and automatic reset is the main chill water controller. It handles from 10% to 100% loads by positioning inlet vanes on the two compressors, either or both of which are used, depending on the load. Also shown is a Taylor 10RF Pressure Controller operating the relief valve on decrease of load to maintain proper flow through the evaporator.

Other instrumentation (not shown) includes a Taylor Recording Controller with the averaging type of long capillary bulb and automatic reset. It operates outside and return dampers, a steam valve and a chilled water valve with sequence operation. A Taylor Wet Bulb Controller permits economy of operation by using outside air for evaporative cooling until outside conditions rise to the point where refrigeration is needed.

This is one of the many large industrial air conditioning projects on which Buensod-Stacey and Taylor have successfully collaborated. If you have a similar problem why not call your Taylor Field Engineer, or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, flow, liquid level, speed, density, load and humidity.

*Reg. U.S. Pat. Off.



One of the two-stage centrifugal compressors in the Taylor controlled Buensod-Stacey air conditioning system in use at the Asheboro, N. C., plant of Bossong Hosiery Mills, Inc.

Taylor Instruments

MEAN

ACCURACY FIRST

IN HOME AND INDUSTRY

GRABLER

SQUARE "GEE" PIPE HANGERS

give relief from time-wasting grief

PAT. APPLD FOR

A DOUBLE CHECK of time-costs on any pipe hanging job will reveal that Grabler Square "Gee" Pipe Hangers are time-cost savings tools. Designed and fabricated to comply with modern engineering and construction practices, they give relief from time-wasting grief at the point of assembly. Many more types are illustrated in Grabler's Pipe Hanger Catalog. Ask your wholesaler for Grabler Square "Gee" Pipe Hangers.

THE GRABLER MANUFACTURING COMPANY
6565 Broadway • Cleveland 5, Ohio

THE SQUARE "GEE" LINE INCLUDES: Malleable Fittings • AAR Fittings • Unions • Rail Fittings • Cast Iron Steam Fittings • Cast Iron Drainage Fittings • Patented Drainage Fittings • Copper Tube Solder-Joint Fittings • Cast Brass Solder-Joint Drainage Fittings • Steel Pipe Nipples • Hangers

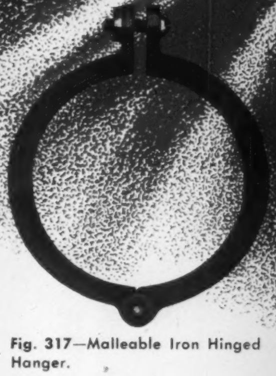


Fig. 317—Malleable Iron Hinged Hanger.

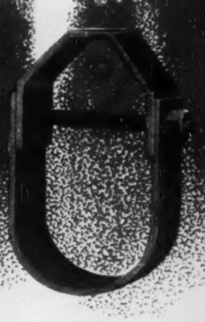


Fig. 97—Steel Clevis Approved by Underwriters' Laboratories and Factory Mutual Laboratories.

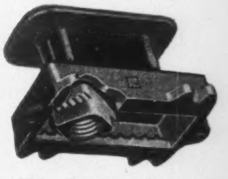


Fig. 315—Concrete Insert Approved by Underwriters' Laboratories and Factory Mutual Labs.

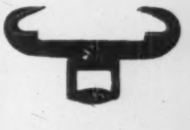


Fig. 392—Malleable Iron Adjustable, I Beam Clamps.

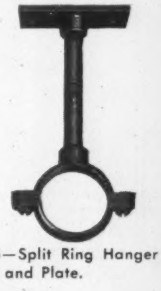


Fig. 65—Split Ring Hanger with Nipple and Plate.

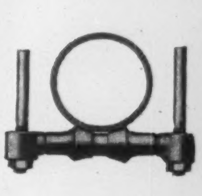


Fig. 103—Single Roller Hanger.

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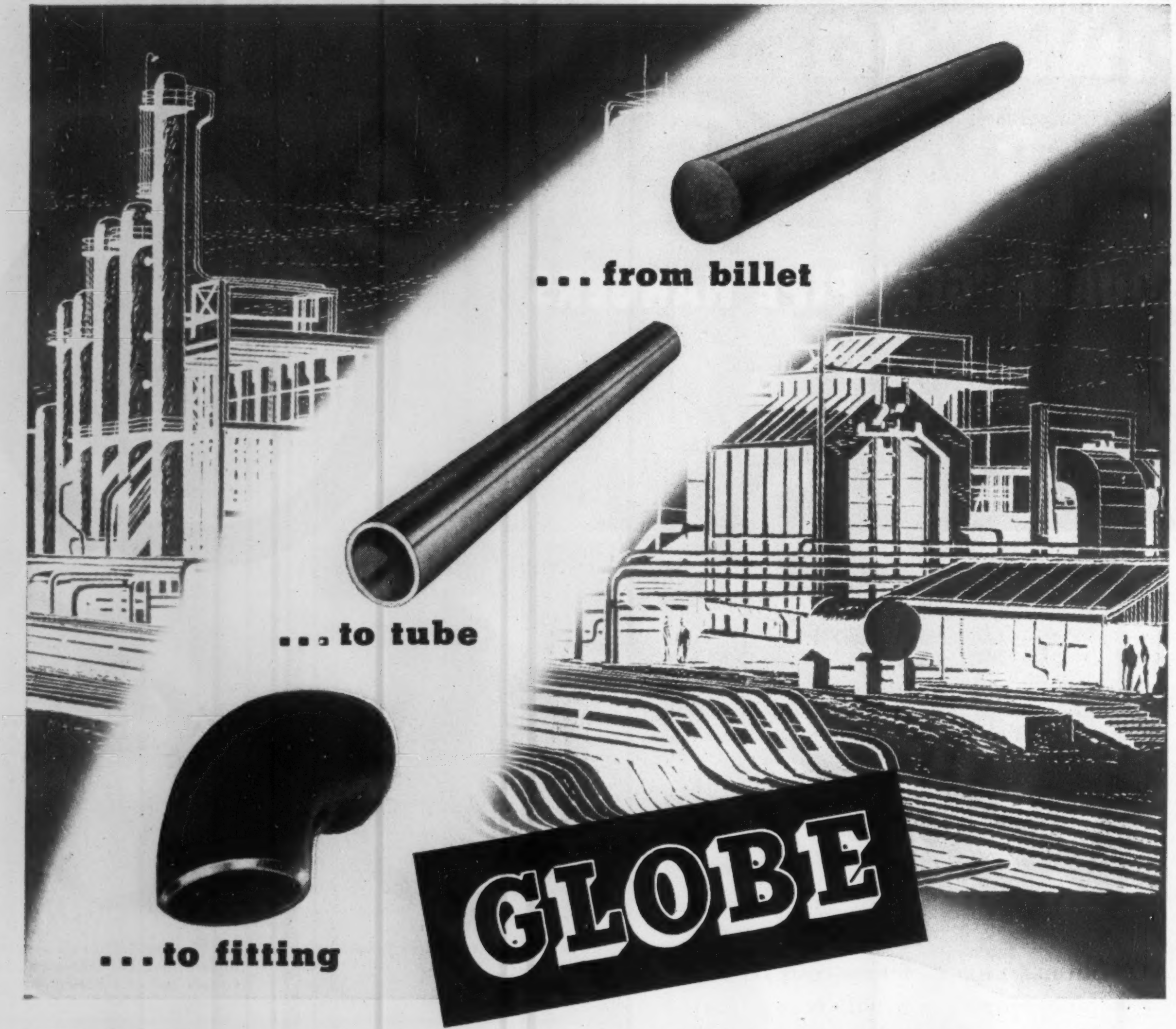

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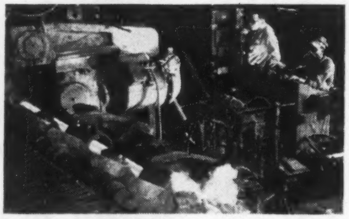

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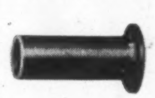

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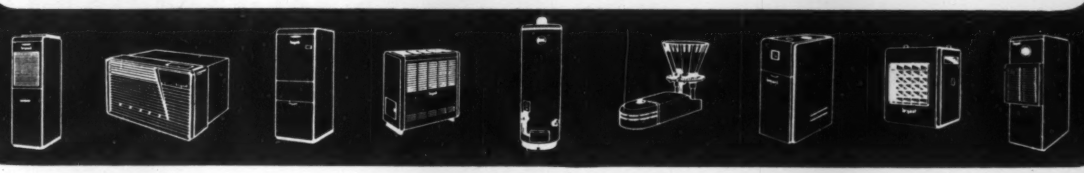

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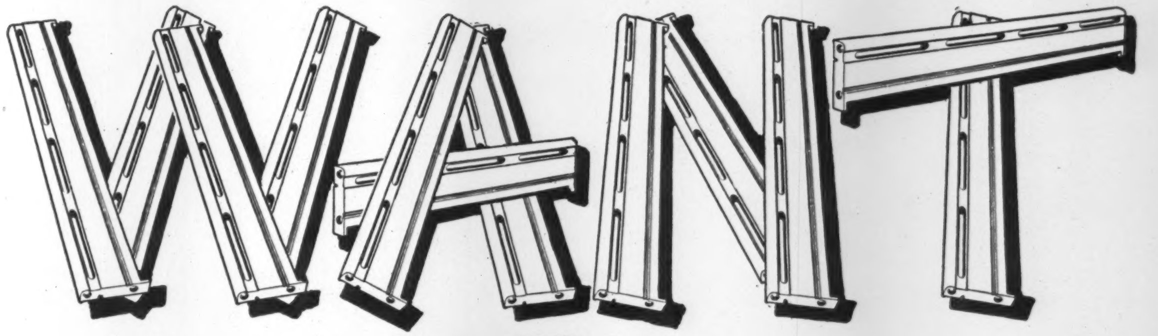

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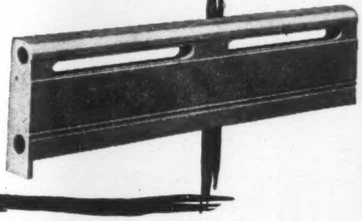

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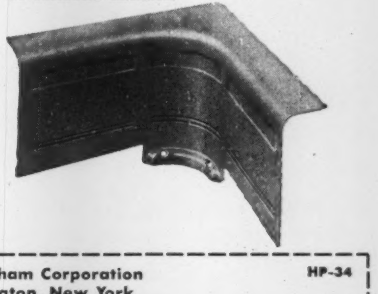

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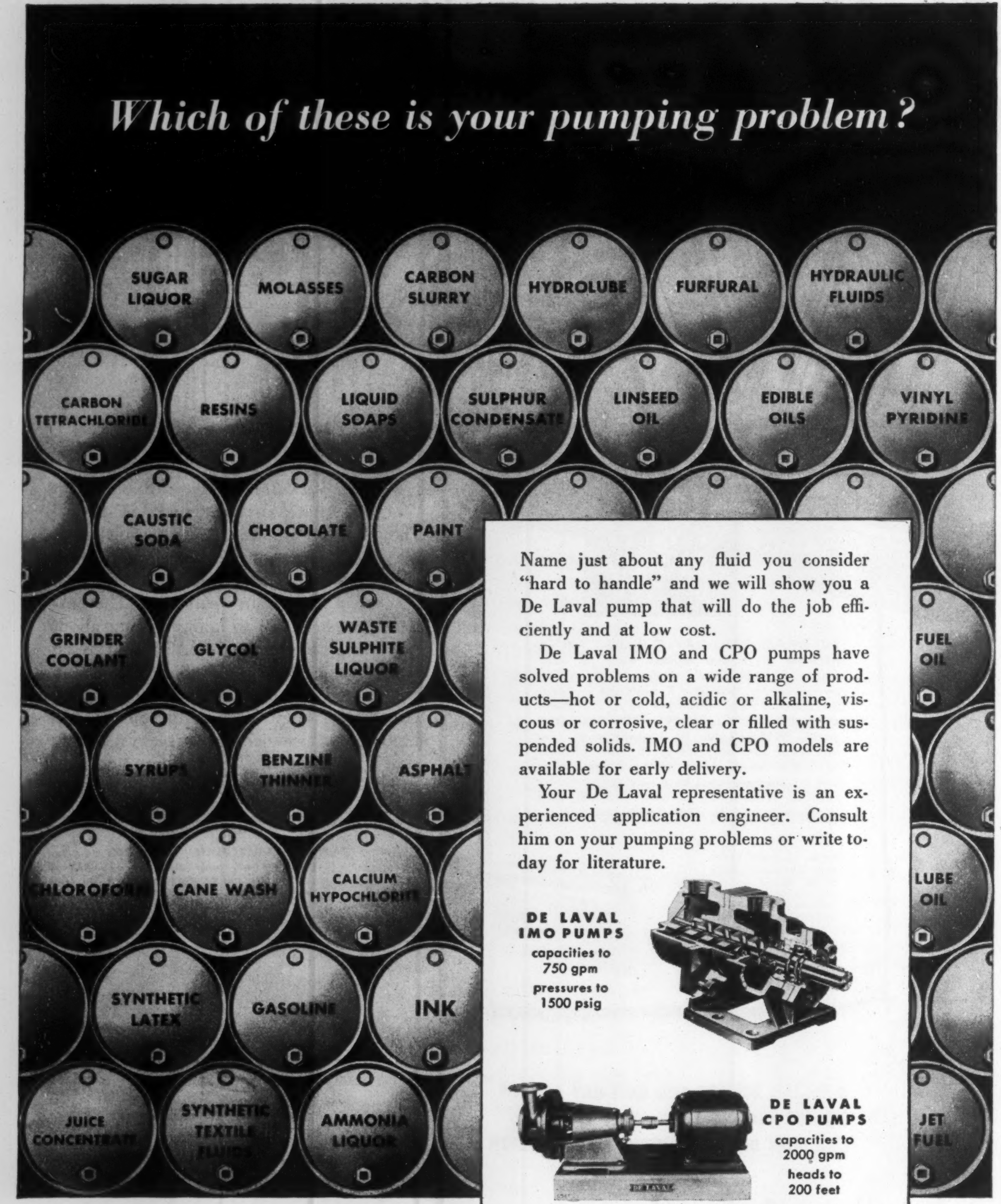
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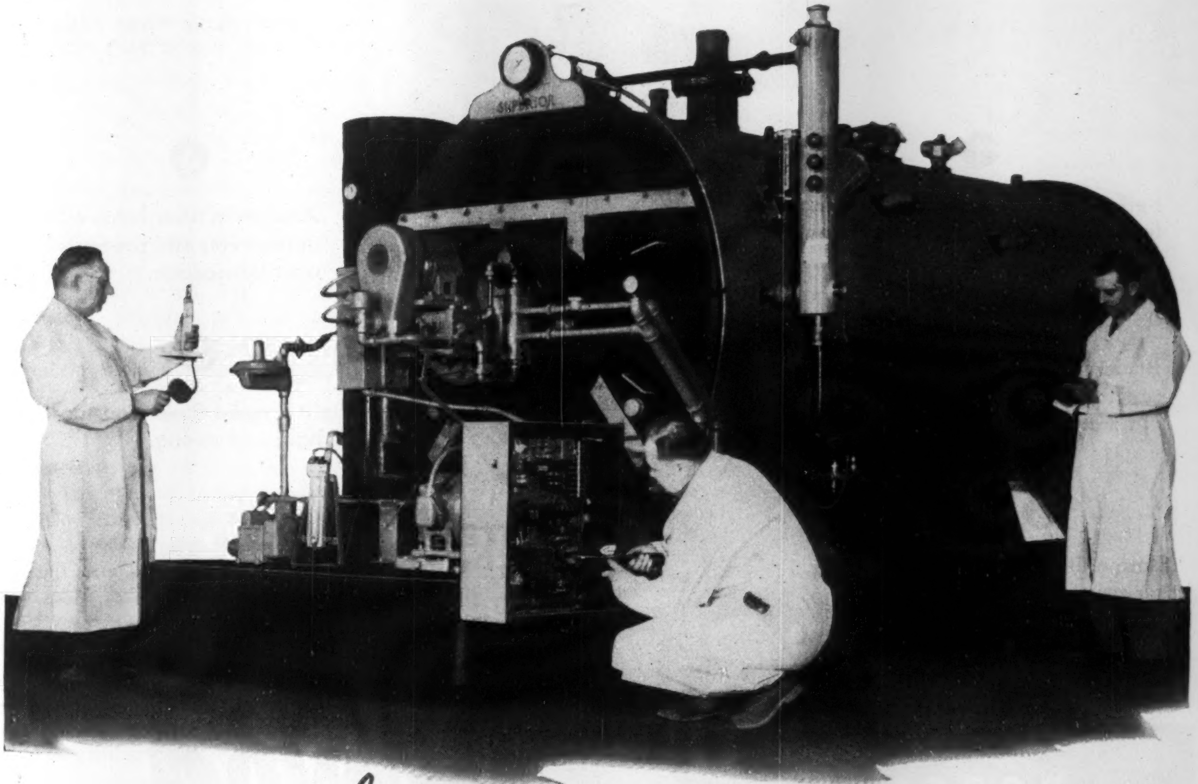

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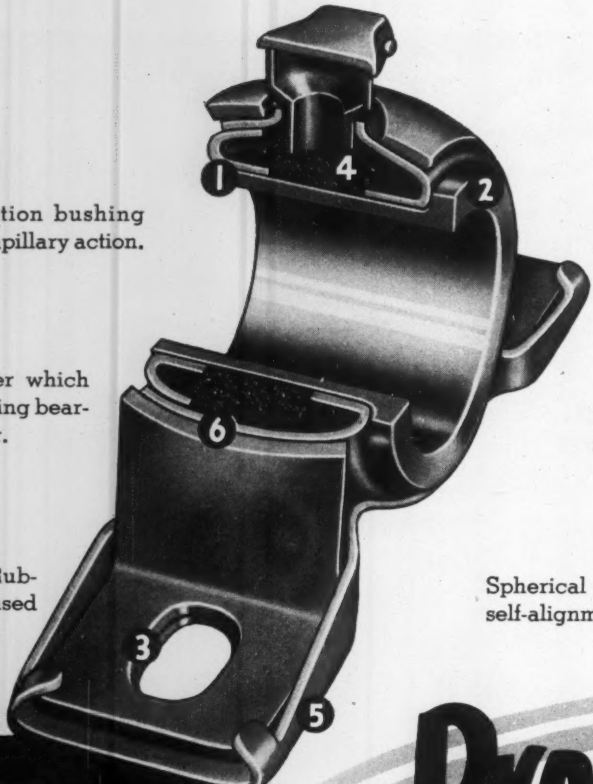

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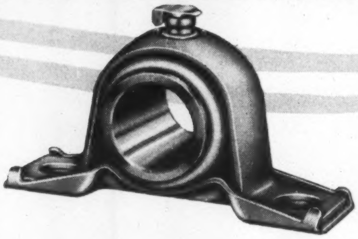

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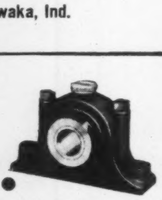
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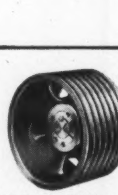
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Steam traps are rated on continuous flow—the amount of hot condensate that flows through the trap when the valve is wide open. However, although this is the accepted method for rating traps; these figures are trap ratings, not capacity in operation.

The rating of the trap selected should always be more than the actual amount of condensation to be handled. This procedure is necessary since condensation capacities are based on continuous flow, whereas traps operate intermittently, open half the time and closed half the time. In addition, a pressure drop when steam is first turned on, reduces the pressure differential which then reduces trap capacity at a time when the load is heaviest. Further considerations affecting the factor are the heating-up time desired, and the necessity for venting large quantities of air.

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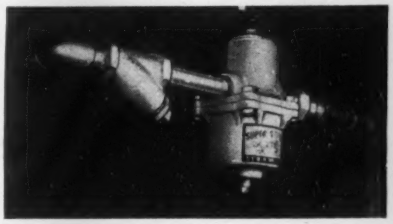

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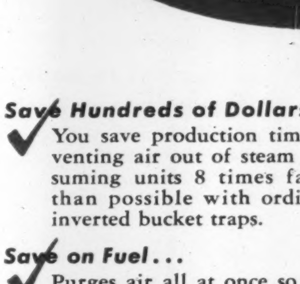

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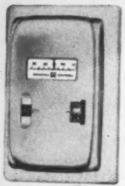

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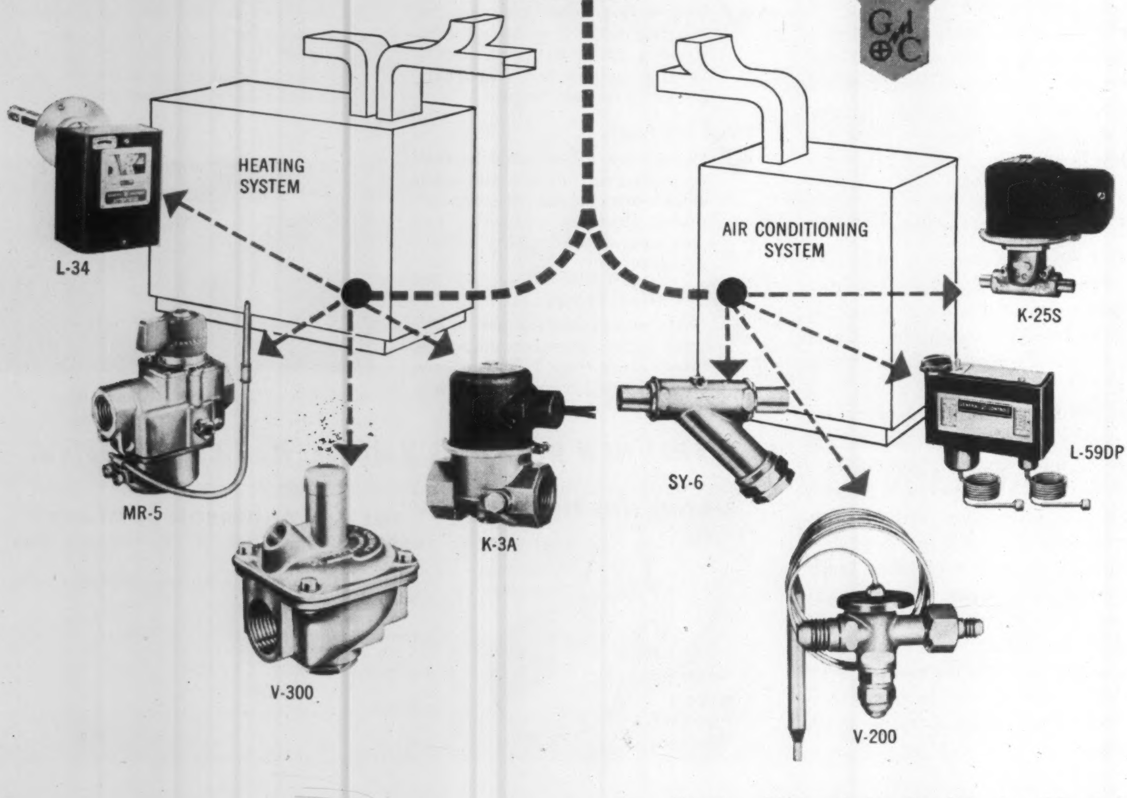

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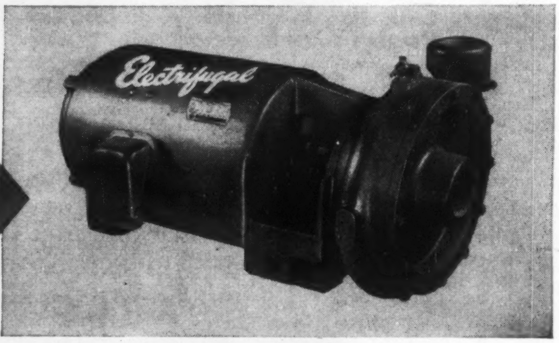
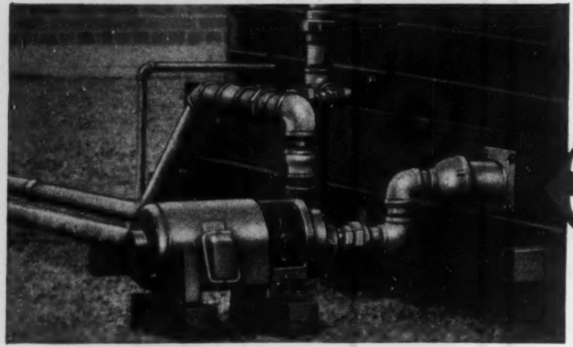
2





3

SAVE ON INSTALLATION TIME

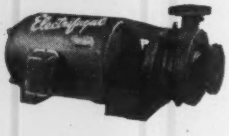
Bolt it down, hook up the line and piping, and your Allis-Chalmers pump is ready to go. There's no alignment problem. Correct installation is a big factor in pump performance and the A-C engineer will advise you at this point.

For more information about Allis-Chalmers air conditioning pumps, write for bulletins 52B6140, 52B7529, 52B6083 or 52B6975.
ALLIS-CHALMERS, Milwaukee 1, Wisconsin

FHP PACKAGE PUMP

Standard with mechanical seal. Widely used and accepted for air conditioning and refrigeration.

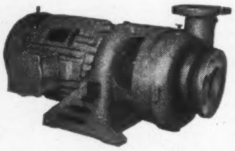
Bulletin 52B7529



***ELECTRIFUGAL* PUMP**

A close-coupled pump with either conventional packing or mechanical seal.

Bulletin 52B6140



SUPPORTING ADAPTER PUMP

Flange motor and pump on sturdy supporting adapter. With conventional packing or mechanical seal.

Bulletin 52B6083

VERTICAL MOUNTED PUMP

Mechanical seal or sealless units with choice of submerged or sidewall mounting.

Bulletin 52B6975

***Electrifugal* is an Allis-Chalmers trademark.**

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-4210

General Contractor:
George Hyman Construction Co., Washington, D.C.

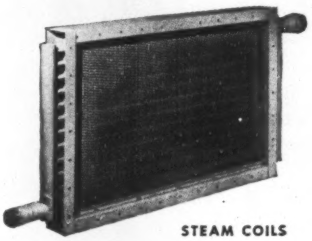
Architects:
Porter and Lockie, Washington, D.C.

Air Conditioning Contractors:
W. G. Cornell Co., Washington, D. C.

This project is being constructed under the supervision of the Washington District, Corps of Engineers.

SPRAY TYPE DEHUMIDIFIER

CEILING TYPE AIR CONDITIONING UNIT



STEAM COILS

Marlo

EQUIPMENT

provides year-round air conditioned comfort in U. S. Soldier's Home Auditorium

Every facility for comfort and efficiency has been incorporated in the new Domiciliary Building of the U. S. Soldier's Home in Washington, D. C. . . . including complete year-round air conditioning in the auditorium.

Modern Marlo equipment, which serves so many buildings in the Washington area, was installed for this important comfort-conditioning job. Marlo air conditioning units, spray type dehumidifier, steam coils and pan humidifiers provide a pleasant living atmosphere for residents of this handsome structure. Marlo equipment is designed to serve any air conditioning need . . . better!

FOR INFORMATION ON THE COMPLETE MARLO LINE, WRITE TO MARLO TODAY

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Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

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They do good turns by the thousands

...with EASY-FLO and SIL-FOS

FOR OVER 20 YEARS EASY-FLO and SIL-FOS have been favorites in the Refrigeration Industry, particularly for joining pipe and tubing. That's because these low-temperature silver brazing alloys consistently produce strong, permanently leak-tight joints, and do it at top speed and bottom costs.

So it is not surprising to find a leading manufacturer of cooling and refrigerating coils using these alloys. The coils are all formed of heavy-wall seamless copper tubing — and all return bends are brazed with EASY-FLO while miscellaneous connections are made with SIL-FOS.

Photos show the return bends on two different types of coils being brazed with EASY-FLO. If you could see how fast these operators go down a stack of coils you would appreciate what a high-production tool EASY-FLO can be, even when hand fed.

IF YOU NEED LEAK-TIGHT JOINTS that will never work loose or need attention, there's no simpler, faster, more economical way to get them than with EASY-FLO and SIL-FOS. BULLETIN 20 will tell you why and how. Write for a copy today.

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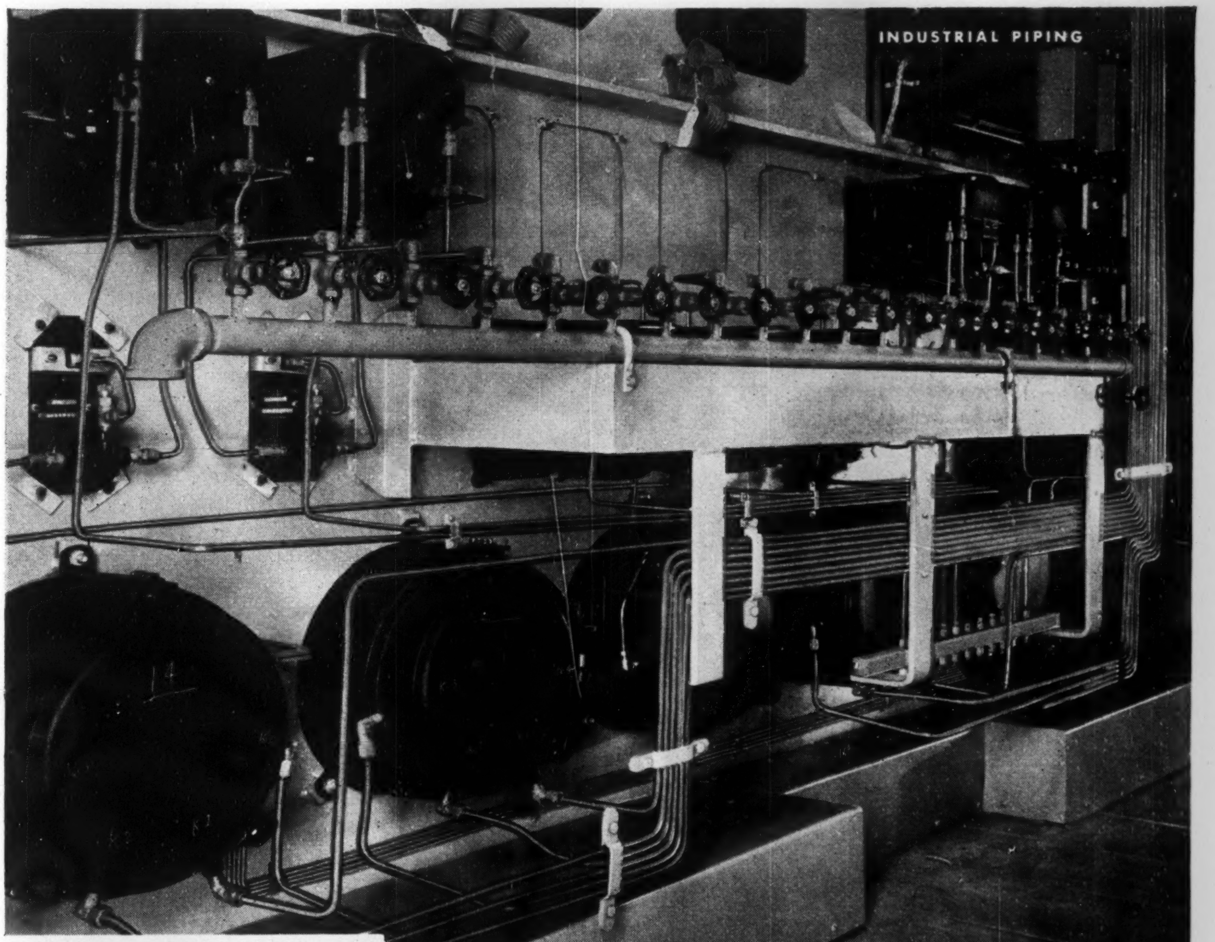
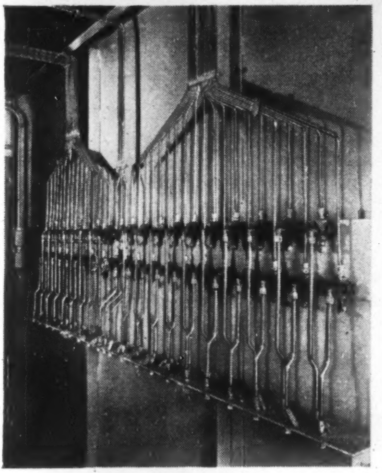


THESE AIR SIGNAL LINES in Toronto's Richard L. Hearn Power Station use copper tube in long lengths, change direction and avoid obstructions without fittings.

Wet air can't rust this copper control piping



MOIST COMPRESSOR AIR can never form rust or scale to impede control in this installation made by Bailey Meter Co., Ltd.

CONTROL would be impaired if moisture could create rust or scale in these pneumatic control lines for coal-pulverizing equipment installed by Bailey Meter Company, Limited, in Toronto's Richard L. Hearn Power Station. A number of these copper tubes convey differential pressures to the pulverizer feeder controllers, while others transmit an air signal to the pulverizers to selectively limit the rate of coal feed. Rust particles which might interfere with the satisfactory operation of the control system cannot form, and the smooth bore keeps flow resistance at a minimum.

Here, as in all copper tube systems, the long lengths, the light weight and the elimination of many fittings by bending all make important savings in installation costs. Where flare or solder-type fittings are used, there are no threads to cut, and connections stay tight.

Publication C-24 offers many additional facts on how ANACONDA Copper Tubes can help improve product quality, reduce operating and maintenance costs and avoid costly shutdowns. Write to: *The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

5330

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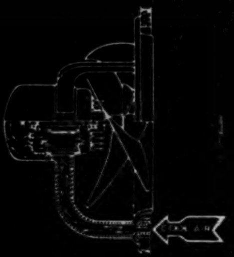
ANACONDA®

distributor for

Copper tubes and fittings for industrial process lines, water, heating and sanitary drainage systems; American Flexible Metal Hose and Tubing; American Vibration Eliminators.

Faster Air Change...

with lower maintenance and power costs!



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- Clean, cool, fresh air is drawn into fully enclosed motor through outside vent pipe.
- Motor stays clean, cools itself—no dusty, greasy air reaches it to interrupt service, shorten its life.
- Low operating cost—you save up to 10% on power costs alone. "Self-cooled" construction is an ILG exclusive ... no other fan has it!

ILG SELF COOLED MOTOR FAN
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CHICAGO U.S.A.

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The secret is in ILG's exclusive SELF-COOLED MOTOR!

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Clear up all doubt... count on ILG to clear the air for action!

ILG ELECTRIC VENTILATING CO.
2850 N. Pulaski Road, Chicago 41, Illinois

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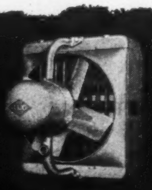
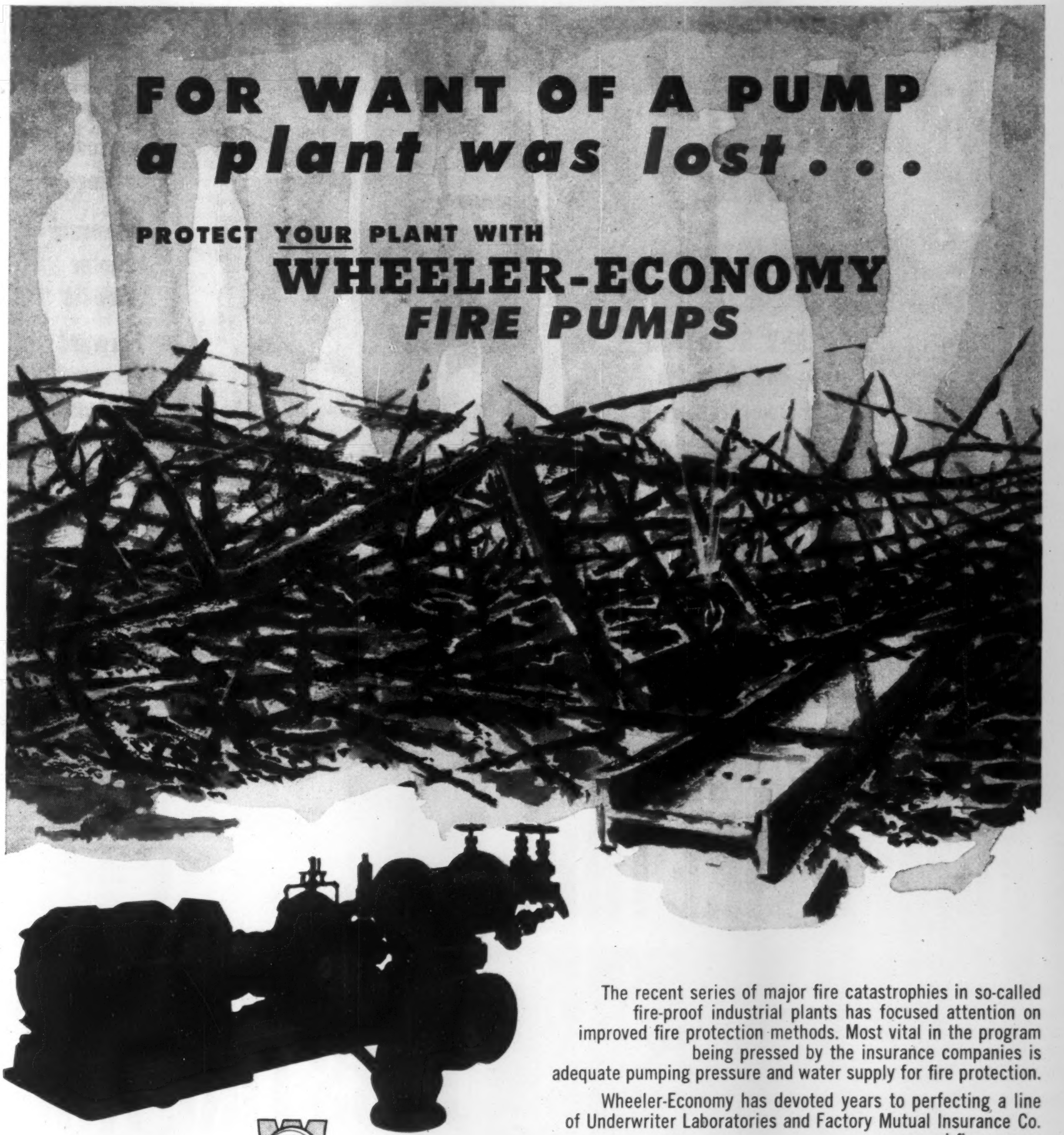

Unit Heaters

Centrifugal Fans



The recent series of major fire catastrophies in so-called fire-proof industrial plants has focused attention on improved fire protection methods. Most vital in the program being pressed by the insurance companies is adequate pumping pressure and water supply for fire protection.

Wheeler-Economy has devoted years to perfecting a line of Underwriter Laboratories and Factory Mutual Insurance Co. approved fire pumps.

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Write for Bulletin and name of nearest Wheeler-Economy representative.

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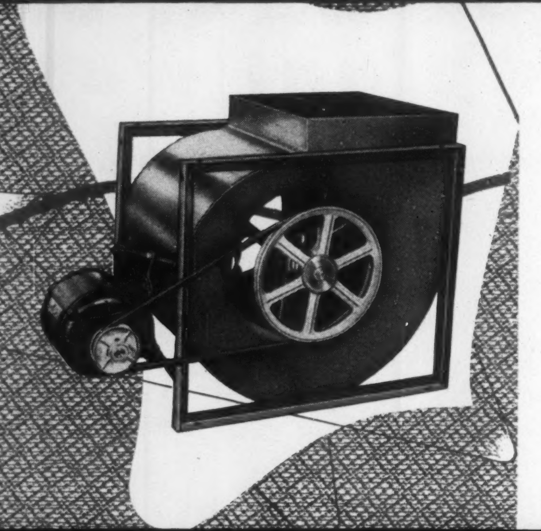
TYPE "N" BLOWERS



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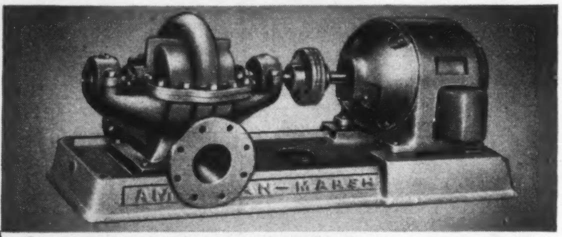
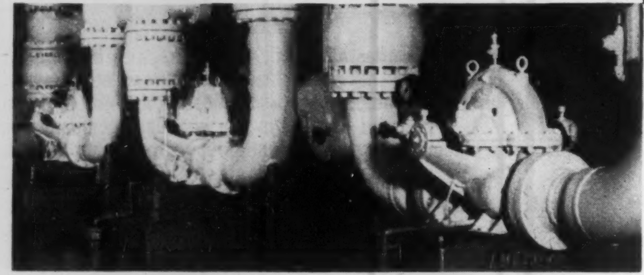


Conventional stuffing box or mechanical seals.



Above — Three bronze-fitted American-Marsh Centrifugals, with direct drive 150 HP motors, each circulate up to 2,000 GPM of chilled water in air conditioning system.

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WRITE FOR BULLETIN 350 for details of Model HLM above — or describe your application.

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Showing the Step-*by*-Step Construction *of* *Therm-O-Tile*

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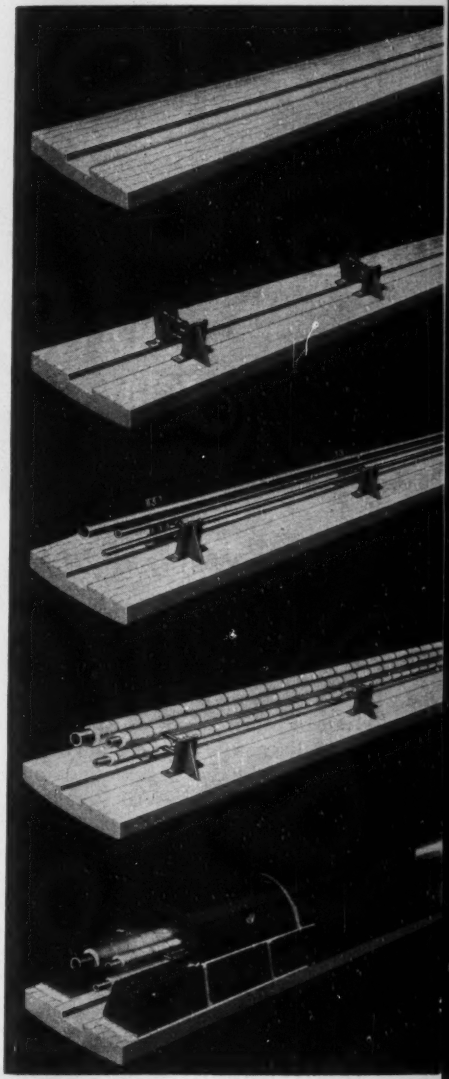
Underground Steam Conduit

Referring to the photographs, Step 1 shows how the rigid 4-inch base of concrete is poured directly into the trench bottom. This furnishes a permanent immovable foundation on which the piping and conduit rest independently of each other. There can be no sagging or formation of condensate pockets with such a base as this.



Step 2 shows the Pipe Supports in place. This is quickly and easily done because of the "sidewalk" on which the men work.

Step 3 shows the piping in place — also quickly and easily done. Labor cost is kept low. No interference between different groups of mechanics thus permitting work of the highest quality.

Step 4 shows the insulation in place.

And finally, Step 5, the Base and Arch Tile are installed.

These five operations, all performed under ideal conditions, assure a highly efficient and economical conduit installation.

ASK FOR DATA.

Bulletin 511 gives complete construction details, uses, and shows typical installations.

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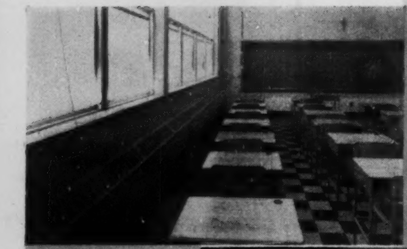
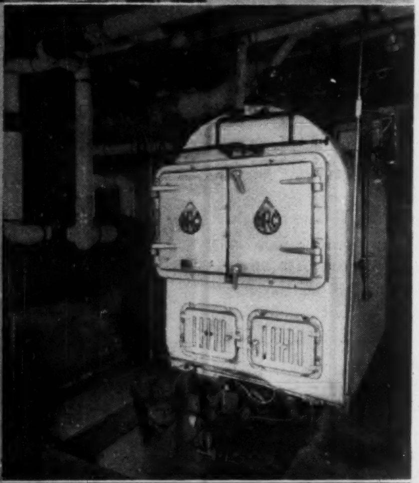


A typical schoolroom in the Immaculate Heart of Mary School of Rutland, Vermont, showing how National Fintube Convectors effectively protect children from window drafts.



This National Commercial Steel Boiler in the basement of the Immaculate Heart of Mary Church at Rutland, Vermont supplies steam to the church and forced hot water heat plus domestic hot water to the school.

The Immaculate Heart of Mary School in Rutland, Vermont. Architects: Dirsa and Lampron, Manchester, N. H.; General Heating Contractor: Lyman Russel.

This NATIONAL COMMERCIAL STEEL BOILER serves a dual purpose

Steam Heat for a Church
Hot Water Heat for a School
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Domestic Hot Water Supply

When a heating system was required for the new Immaculate Heart of Mary School in Rutland, Vermont, it was decided to install a new heating plant in the basement of the adjoining church to take care of both buildings' heating problems.

A National Commercial Steel Boiler, replacing the former boiler in the church now provides the essential steam heat requirements of the church, and in addition, services the new school building with adequate heat of even, comfortable temperatures with National Fintube Convectors.

Economy of installation, minimum maintenance and low operating costs were the considerations that determined the selection of the National Heating System.

For detailed information on National Heating Products, write for Catalog No. 586-HP.

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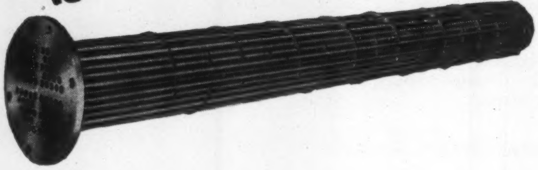

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For full details and application data, send for Bulletin CWF and schematic on "Controlled Velocity".

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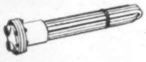

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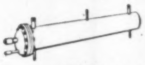
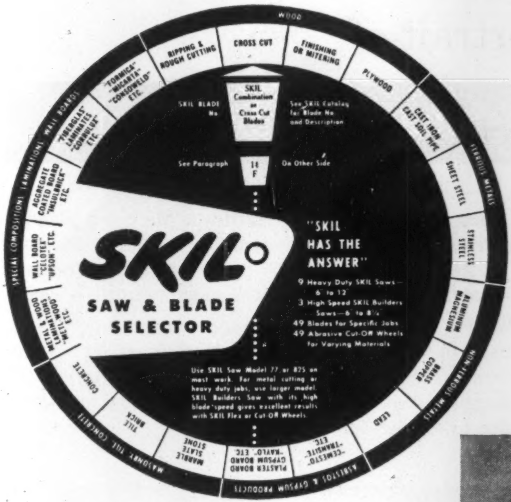


Chillers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See Paragraph
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3 High Speed SKIL Builders Saws—6" to 8¼"
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49 Abrasive Cut-Off Wheels for Varying Materials
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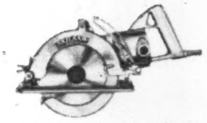
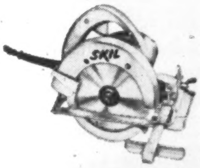
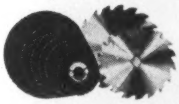


9 Extra-Heavy Duty SKIL Saws—with high-torque worm drive. The favorite type for over 25 years on tough metals and compositions that no other saw can handle. Absolutely minimum maintenance in heaviest service. Blade diameters from 6" to 12".



3 Heavy Duty SKIL Builders Saws—with high blade speed. Low in cost, light weight and easy to handle. The new SKIL Builders Saws are ideal for quick cut-off work and for use with SKIL abrasive cut-off wheels. Blade diameters: 6", 7¼", 8¼".



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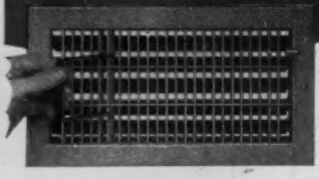
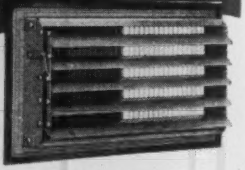
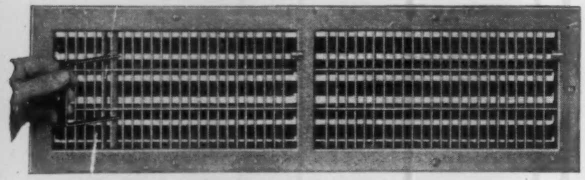


321-A HMV



Rear View Showing "HMV" Valves

Every grille bar adjustable individually—before or after installation



321-A HMV Tandem

Any direction of air flow—right, left, up, down and any combination—is easily obtained with "Fabrikated" Style No. 321-A HMV air conditioning registers, for residence or commercial installations, on sidewalls or ceiling. The face bars are adjustable to right or left; valves on the back are adjustable to direct the air flow up or down; valves may also be fully closed, and are connected to open or close in unison.

The angles of deflection and the combinations to be had are practically unlimited. Adjustments for directed air flow may be made before or after installation. Grille bars are held firmly in place and will not vibrate or rattle.

"Fabrikated" registers are available in sizes from 8 x 4″ to 48 x 24″, including tandem style. Special sizes can be made without special die set-up charges.

Write for Catalog No. 52.

Always Leading—Always Progressing

THE INDEPENDENT REGISTER CO.
3747 E. 93rd STREET · CLEVELAND, OHIO

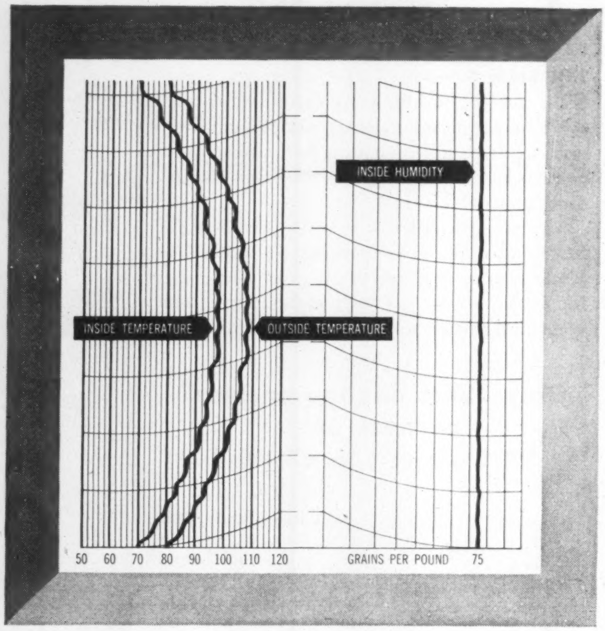
---

portrait of

less than 1% absenteeism

At Auto Specialties' windowless Hartford, Michigan plant, a Kathabar dehumidifier keeps the summer humidity at a constant 75 gr/lb for comfort. Inside temperature is maintained at 72° F—or 10° F lower than outside temperature—whichever is higher.

The results: (1) *less* than *1%* absenteeism; (2) optimum production conditions throughout the summer—even on the hottest, muggiest days; (3) reduction of product dimensional changes due to temperature fluctuations.

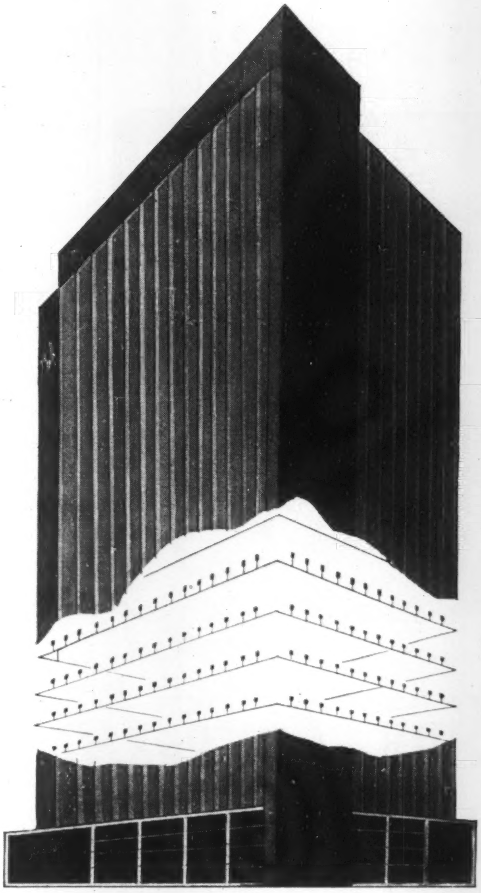


This is a typical example of how Kathabar's 20 years' experience in humidity conditioning serves industry. Whether you are interested in comfort applications or in controlling air moisture in industrial processes, put Kathabar experience to work for you.

Write today
describing your
problem or asking
for Kathabar
Literature
Group K-53-7.

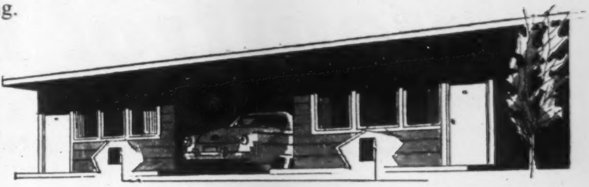
Kathabar
HUMIDITY CONDITIONING

SURFACE COMBUSTION CORP., TOLEDO 1, OHIO
ALSO MAKERS OF
Surface INDUSTRIAL FURNACES **Janitrol** AUTOMATIC SPACE HEATING



Modulated Heat with Thermostat in Every Room

Every room in a building is an individual zone, with its own thermostat. Every room is heated with filtered warm air, continuously circulated by a compact, recessed wall unit. Sets a new standard of comfort and heating economy for every type and size of residential, institutional and commercial building.



SelecTemp Highlights

THERMOSTAT IN EACH ROOM. Temperatures can be varied in every room to fit the "activity plan" and personal preference of the occupants.

MODULATED HEAT. Air circulation is continuous. Both temperature and volume of air is automatically modulated, as required to offset heat loss from room.

FILTERED, CIRCULATED AIR. Individual room air circulation prevents transmission of odors or bacteria from other rooms. Air is cleaned by a spun glass filter in each room unit. Filtered outside air can be introduced if desired.

BOILER LOCATION. Does not require centrally located heating plant. Boiler can be placed in any desired location, with proper distribution of heat to every room.

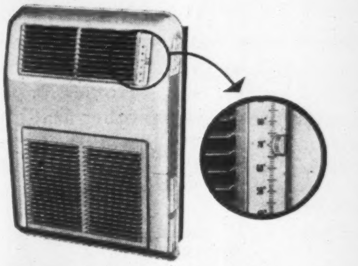
LOW POWER COST. No electricity required to operate circulating fans. Nonelectric thermostats.

LOW INITIAL COST. No other system can be so easily installed in either new or old construction. Small soft copper tubing (¼ inch I.D.) carries steam to individual room heater units. Return lines are ⅛ inch. Tremendous savings in installation costs.

LOW FUEL COST. Temperature easily reduced in unused rooms. Eliminates overheating.

AUTOMATICALLY BALANCED. No special adjustments of dampers, valves or orifices required to balance heating system. Each unit continuously regulates heat needed for each room. Automatically compensates for external heat sources such as fireplace or solar heat, without affecting temperatures of other rooms.

FOR LARGE OR SMALL BUILDINGS



Individual room control with continuous modulated heat

With SelecTemp heating, every room in the building is an *individual zone*, with its own thermostat. Low pressure steam, supplied to recessed wall units through small flexible copper tubing, provides heat and power for the circulating fan. Thermostats are nonelectric and require no wiring.

Exact, constant temperatures

Each room thermostat may be set at any temperature from 40 to 90 degrees. Heat in each room is accurately maintained at the temperature selected. The thermostat detects any change in temperature and regulates both the speed of the circulating fan and the steam supply to exactly meet heating requirements. SelecTemp thus eliminates ordinary on-and-off cycling and "cold 70" stratification. It constantly modulates from 1/20th of capacity to full capacity, supplying just the amount of heat needed. SelecTemp compensates automatically for variations due to changes in outdoor temperature, and in velocity and direction of the wind. It compensates for heat gains from the sun's heat, fireplaces, cooking ovens and body radiation.

Low installation and operating cost

The various parts of the selecTemp system are engineered for rapid economical installation without time wasting special provisions. SelecTemp units are delivered assembled in steel enclosures for mounting in wall stud spaces or wall openings. No electric power required for operation of circulating fans or thermostats—an important saving. Fuel savings result from elimination of wasteful overheating and from lower temperatures in unoccupied rooms. Small steam lines greatly reduce heat transmission losses.

SelecTemp
TRADE MARK
PRODUCT OF IRON FIREMAN

Send for full information

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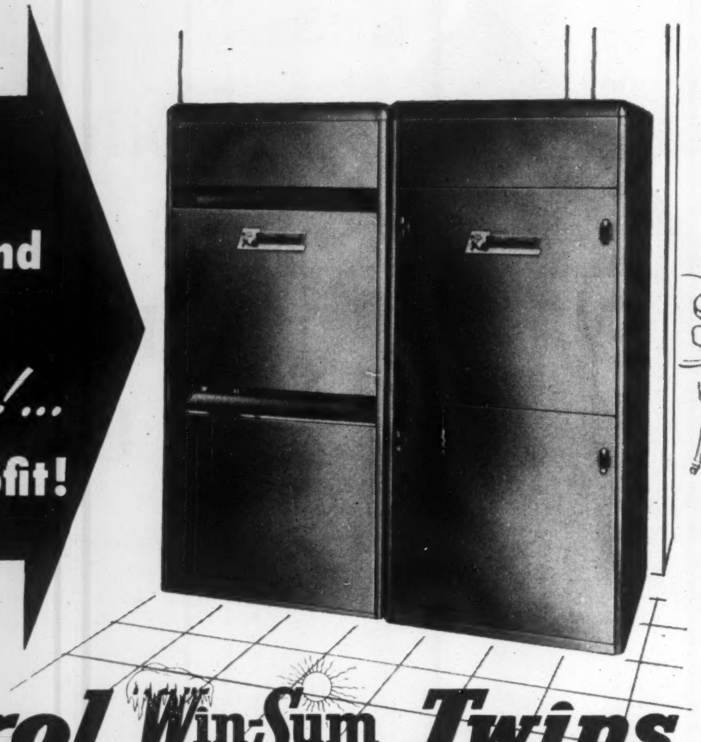
I. F. Mfg. Co.

IRON FIREMAN MANUFACTURING CO.
3152 W. 106th Street, Cleveland 11, Ohio.

Please send literature on Iron Fireman SelecTemp heating.

Name
Address
City State

install the
finest year 'round
conditioning
with confidence!...
in product and profit!



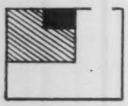
®Janitrol Win-Sum Twins

ENABLE YOU TO SELL ALL-SEASON COMFORT TO AVERAGE HOME AND BUSINESS OWNERS—

Year 'round conditioning the Janitrol way, need not be confined to so-called luxury installations.

With the Janitrol Win-Sum Twins your sales opportunities are broadened to the mass market of medium priced homes, retail stores and small business buildings. All three Janitrol Summer Units in 2, 3 and 5-ton sizes can be economically "twinned" with new or old forced warm air systems to utilize the same duct work.

When you handle Janitrol equipment, you are backed up by extensive advertising in such magazines as Saturday Evening Post, American Home, House Beautiful, Better Homes & Gardens, Business Week and other leading publications. Janitrol offers you one of the most complete array of sales helps in the industry.



SPACE SAVING

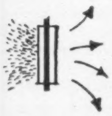
You need only a 27" square for the 2 or 3-ton Janitrol conditioners. They are out of the way in the utility or recreation room.

5-YEAR WARRANTY

The Janitrol unit is factory sealed. Maintenance is minimized. This cooling system is fully covered by a 5-year warranty.

WHISPER QUIET

Janitrol is the quietest unit made. Rubber mountings and thick insulating blanket lining efficiently absorb operating sounds.



FILTERED COOLING

Over 5 square feet of filters removes the dust, dirt and pollen from Janitrol cooled air for a healthier, cleaner home.

WRITE TODAY ABOUT JANITROL REPRESENTATION IN YOUR CITY.

®Janitrol

DIVISION • SURFACE COMBUSTION CORP.
400 DUBLIN AVE., COLUMBUS 16, OHIO

put this department out of business

by using the I-R motorpump on every job

COMPLAINT DEPARTMENT

I-R Motorpumps are designed and built to give you a combination of "extras" . . . .

- Minimum maintenance - you put it in the system and forget it for years.
- Installation speed and ease in any position - anywhere.
- Extra efficiency that makes the I-R Motorpump a winner in size-for-size comparisons.
- Overall compactness that saves space.
- Real money savings because you can often use a smaller size to do a big job.
- PROMPT SHIPMENT FROM STOCK

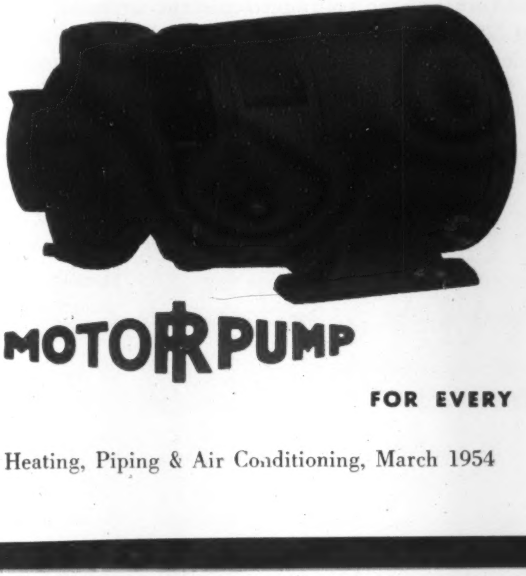
reduce "service" calls to fatten profits.

Every time you *don't* have to answer a customer's complaint . . . *don't* have to send out a service man, you add dollars to your profits.

And one of the best ways we know of to make profit is to use only components that will stand up to the toughest job and stay on that job year-in, year-out. Naturally, that means that the pumps you install should be Ingersoll-Rand.

"Naturally" because we've been building them longer—know more about pumps. "Naturally", too, because we check them to more exacting quality standards. What's more, you can get quick delivery anytime, anywhere, because of big stocks of many sizes in warehouses in every major area.

You can get I-R Pumps easily — put them in easily —rest easy in your mind after they are in because they'll give peak performance all the time.



MOTOR IR PUMP

Ingersoll-Rand

11 BROADWAY, NEW YORK 4, N. Y.

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FOR EVERY JOB IN AIR CONDITIONING

Built-in
$AVING$
make
JENKINS BRONZE GATES
your
BEST BUY

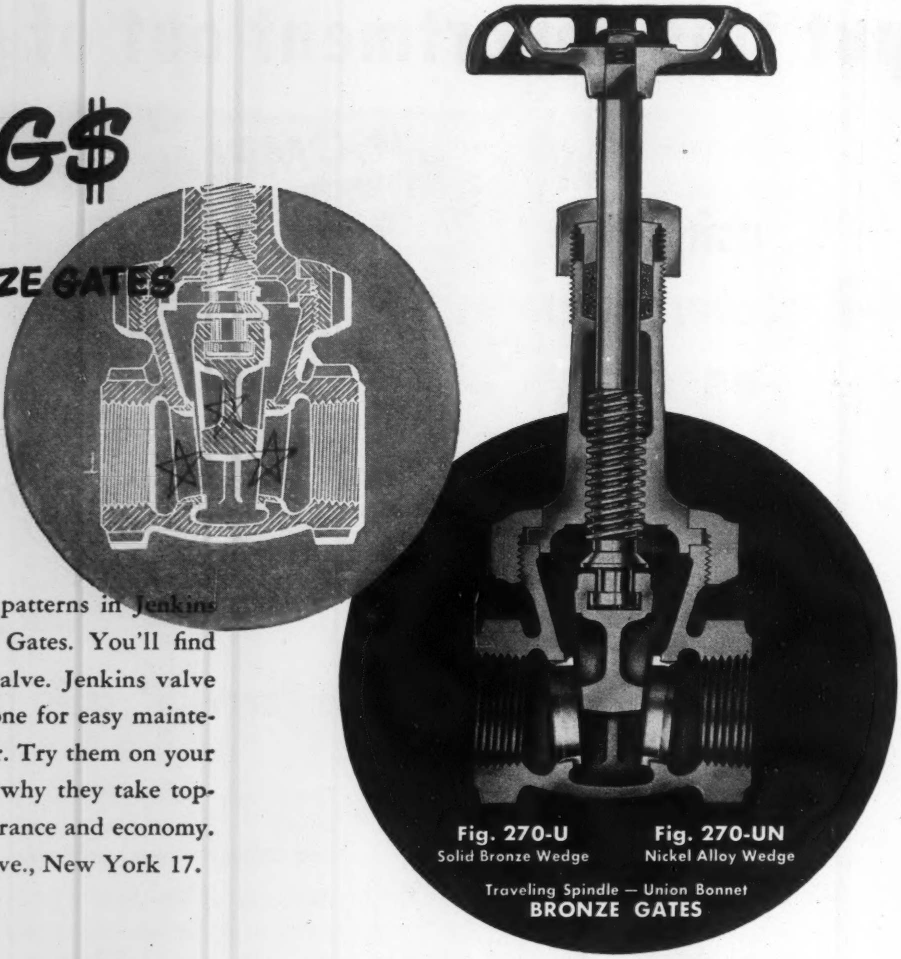


Fig. 270-U
Solid Bronze Wedge

Fig. 270-UN
Nickel Alloy Wedge

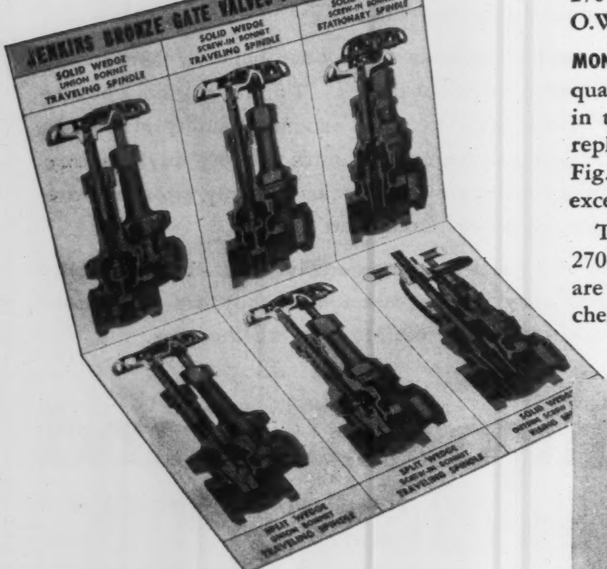
Traveling Spindle — Union Bonnet
BRONZE GATES

Look over any of the 35 patterns in Jenkins complete line of Bronze Gates. You'll find *savings* built into every valve. Jenkins valve specialists designed each one for easy maintenance and extra long wear. Try them on your toughest services and see why they take top-rating in any test for endurance and economy. Jenkins Bros., 100 Park Ave., New York 17.

Typical of Jenkins design for built-in savings are the Fig. 270-U and Fig. 270-UN Gates for 200 lb. Steam, 400 lb. O.W.G. services.

MONEL AND BRONZE SEATING COMBINATION In Fig. 270-U a high quality bronze wedge seats against MONEL rings expanded in the body. The wedge takes the wear — it can easily be replaced when necessary by slipping a new one on the stem. Fig. 270-UN, with a nickel alloy wedge, is recommended for exceptionally severe conditions of rapid wear and corrosion.

These and other features of rugged construction make Figs. 270-U and 270-UN first choice for economy where conditions are most destructive to valves, as in oil refineries, dye houses, chemical, food, and rubber plants.


JENKINS BRONZE GATE VALVES FOR ANY SERVICE
SOLID WEDGE UNION BONNET TRAVELING SPINDLE
SOLID WEDGE SCREW-IN BONNET TRAVELING SPINDLE
SOLID WEDGE SCREW-IN BONNET STATIONARY SPINDLE
SPLIT WEDGE UNION BONNET TRAVELING SPINDLE
SPLIT WEDGE SCREW-IN BONNET TRAVELING SPINDLE
SOLID WEDGE OUTSIDE SCREW

Jenkins Bronze Gate folder shows the many types available — lists convincing reasons why they are your best buy for any service. Ask for Form 181-A.

JENKINS
LOOK FOR THE DIAMOND MARK
VALVES
SINCE 1864
TRADE JENKINS MARK
Jenkins Bros

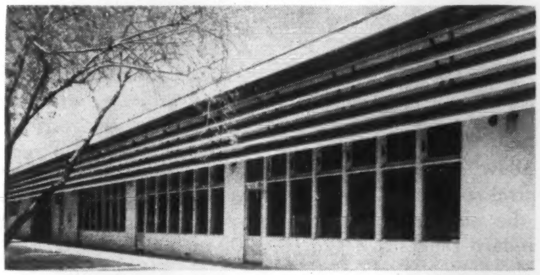
SOLD
THROUGH
LEADING
INDUSTRIAL
DISTRIBUTORS

EQUIPMENT DEVELOPMENTS . . .

Add the new products and companies listed here to your Directory Section which you received in your January 1954 Heating, Piping & Air Conditioning, and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

Sun-Reflecting Louvers

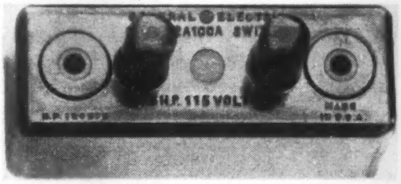
Aluminum louvers to intercept sun glare and to convert it into diffused light for correct interior lighting . . . . The manufacturer states that they reduce the load on air conditioning systems up to 61 percent where large window areas are involved. The louver is aluminum with an anodized finish designed to deflect hot sun rays. The equipment is recommended for factories, offices and schools and other buildings.



Manufacturer—The Kawneer Co., Niles, Mich.

Manual Starting Switch for FHP Motors

Manual starting and overload switch for fractional horsepower motors. . . .Essentially a start-stop switch with manual reset overload, the new unit is designed to control fhp motors where line current overload protection is required. It is totally enclosed. Protection against overload is provided during both starting and running through the use of a nichrome heater and a nickel alloy bimetal strip in the tripping mechanism. Depressing the start button during overload reportedly will not re-energize the motor until the overload condition is removed and the bimetallic strip returns to normal position.



Manufacturer—General Electric Co., Schenectady 5, N.Y.

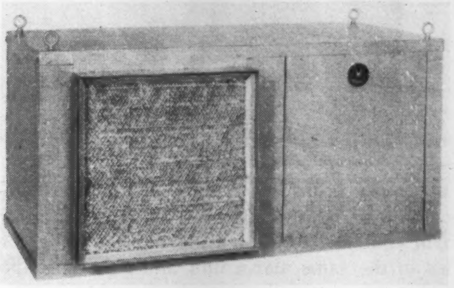
Pen Lifter for Recorders

Automatic pen lifting device for single record strip chart recorders. . . .A rod and lever arrangement, operated by a solenoid raises the pen clear of the chart depending upon the requirements of the application. The pen lifter can be wired so the pen is automatically lifted clear of the chart when the chart motor is turned off. For test cell applications terminals can be provided at the rear of the instrument for external wiring in order that the chart drive switch and pen lifter solenoid may be remotely operated.

Manufacturer—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Philadelphia 44.

Ceiling Air Conditioner

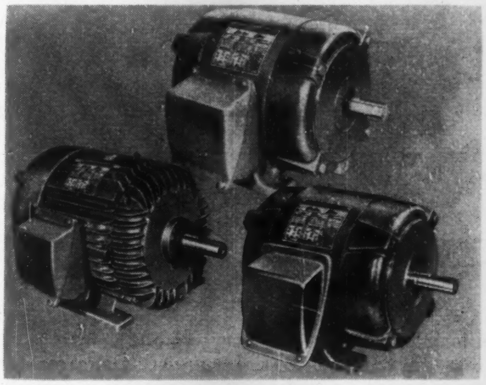
Ceiling model air conditioner. . . . Known as the "O" series, it is a self contained unit featuring a hermetically sealed compressor, a capillary system and throw away filters. According to the manufacturer, the 2-ton unit exceeds its rated capacity, producing 28,000 Btu which is 4000 Btu over its required output. The unit is mounted on the ceiling or can be installed in the attic. It is designed to be used for free discharge or be attached to a duct system.



Manufacturer—Barkow Mfg. Co., 2230 S. 43rd St., Milwaukee 15, Wis.

Induction Motor

"Life Line-A" induction motor designed for longer life, greater flexibility and higher reliability as well as decreased size . . . . It has improved ventilation, better insulation, more efficient and better protected bearings, and is quieter and smaller per horsepower, conforming to the new NEMA standard dimensions, the company states. The motor is available in three enclosures:



EQUIPMENT DEVELOPMENTS . . .

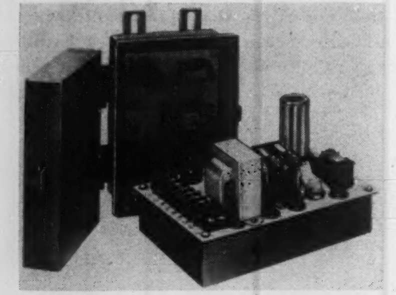
[Continued]

totally-enclosed fan cooled, totally-enclosed non-ventilated, and drip-proof.

Manufacturer—Westinghouse Electric Corp., 401 Liberty Ave., Box 2278, Pittsburgh 30.

Electronic Flow Alarm

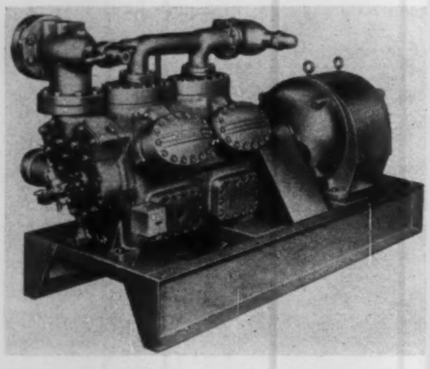
**Electronic "Flo-Gard" alarm device for rotameters, manometers and similar process instruments. . . . According to the company, the unit will operate in conjunction with spherical floats as small as 3/32 in. and will detect 1 mm of float position change. In the event of power failure or failure of any electronic component, the load relay is designed to drop out and operate the alarm contacts. Two sensing coils may be connected in series to the same alarm unit and either installed on a single rotameter to provide both high and low flow alarms, or installed on separate rotameters.



Manufacturer—Brooks Rotameter Co., Landsdale, Pa.

Reciprocating Compressor

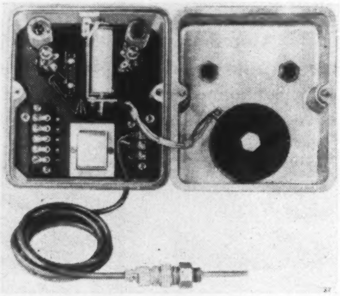
New 12 cylinder, 75 to 100 hp reciprocating compressor for air conditioning and refrigeration duty featuring simplified installation and compactness . . . . It is designed for use at air conditioning temperature levels, for commercial or industrial refrigeration applications, or for low temperature work down to −100 F. Features include a special oil separator and control system to eliminate oil from the refrigerant circuit and prevent loss of oil on starting, full flow oil filter and a new type shaft seal.



Manufacturer—Carrier Corp., 300 S. Geddes St., Syracuse 1, N. Y.

Electronic Temperature Controller

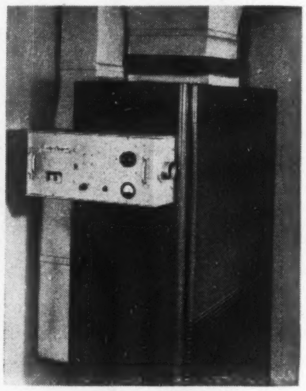
"Series 97" two-zone electronic temperature controller. . . .It uses a resistance temperature detector element as a sensing device in a bridge circuit in conjunction with a high gain phase sensitive amplifier relay unit. A single dial sets the temperature control point, and red and green lights indicate whether the temperature is above or below the set point. The single pole two-way control contact will handle 220 volts at 5 amp. According to the manufacturer, sensitivity is 0.1 F on all ranges. Standard ranges are 0 to 100, 300 or 500 F and C.



Manufacturer—Fielden Instrument Div., Robertshaw-Fulton Controls Co., 2920 N. 4th St., Philadelphia.

Ozone Generator

Ozone generator, "Type CV Air Clears," for use with forced air heating or cooling systems. . . . The self-contained unit mounts on the sidewall of a heating-cooling unit or on the suction side of an air duct where ozone can be introduced directly into the air stream. By oxidizing foreign matter in the air, it eliminates odors and "starves" mold spores. According to the manufacturer, it has no moving parts and requires no maintenance other than periodic cleaning.



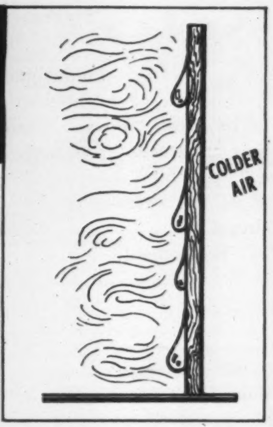
Manufacturer—General Ozone Corp., 855 W. Washington Blvd., Chicago 80.

Industrial Thermometers

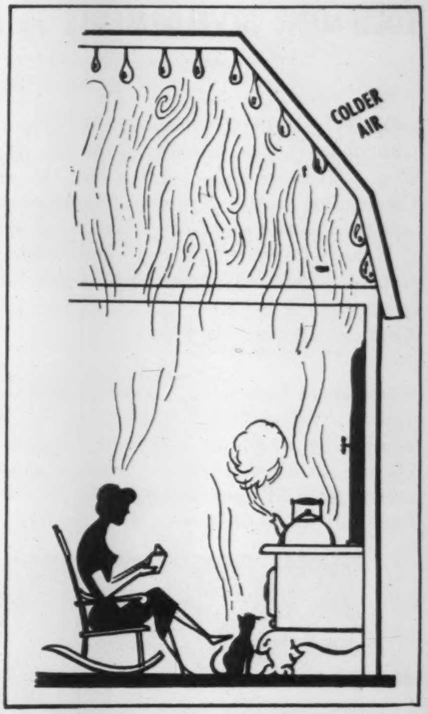
New line of 5-in. scale, mercury-in-glass industrial thermometers with separable sockets . . . . Designed specifically for restricted space applications, these thermometers are offered in five case angles: straight, 90 deg rear angle, 90 deg right and left side angles, and 135 deg oblique. The separable socket of the "Princo" ther-

How to Stop CONDENSATION!

Prevent Damage to Wood, Plaster, Paint, etc.



Condensation forms when temperature of contacting air is reduced below dew-point by a cold surface.



Condensation forms when the capacity of an air space at a given temperature is too small for the amount of vapor present. ⟶

As air grows colder, it can hold less vapor in suspension. The degree of saturation increases until a dew-point is reached, and condensation occurs. The surface of a material colder than contacting air it faces which continuously loses heat on the other side, continuously extracts heat by conduction from the air it faces. The denser and bulkier the material, the more heat it can extract before attaining room temperature, if it *ever* does.

The scientific construction of multiple layers of accordion aluminum, fiber, and air minimizes condensation formation on or within this type of insulation. The reason: The temperature of the air in the warm room and the adjacent sheet of aluminum is about the same. Because the aluminum sheet weighs only ¼ oz. per sq. ft.; has heat ray absorptivity and emissivity of only 3%; it extracts from the air by conduction only enough heat to attain and remain at room temperature.

Since the other sheets of aluminum and fiber retard heat flow by inner as well as outer convection, and conduction is low because of preponderant air spaces of low density, the sheet's other surface faces a space which is only a *little* colder than the aluminum itself. Because warmth flows to cold in radiation and conduction, the aluminum will *give off a slight* amount of *heat* to the colder space, thereby slightly *increasing* the vapor retaining capacity of that space. The succeeding reflective spaces and aluminum sheets behave similarly. Since each aluminum surface is slightly warmer than the air it faces on its cold side, there is no extraction of heat. *(The reverse is true.)*

Where multiple accordion aluminum is used, fortuitous vapor and water (like rain) which intrude into building spaces will, as the vapor pressure develops therein, gradually flow out as vapor through exterior walls and roofs because vapor flows from areas of greater to less density. Since the vapor cannot back up through the continuous, impervious aluminum, it will flow out because exterior walls and roofs have substantial permeability in comparison (with the aluminum), far greater than the required 5:1 ratio.

Of great importance is the use of a continuous metallic vapor barrier of zero water vapor permeability to retard the outward flow of vapor which originates inside the house. Infiltration under the flat stapled flanges of multiple accordion aluminum is slight.

A new multiple accordion aluminum, Infra Types 6-S*i* and 4-S*i*, forms a continuous "blanket" of uniform thickness between joists, giving the entire area maximum protection against heat loss and condensation formation. Write for samples and description.

The U.S. Bureau of Standards has prepared a helpful and informative booklet, "Moisture Condensation in Building Walls," which discusses causes and cures. Use the coupon to get a free copy from us.

COST OF INFRA INSULATION INSTALLED
in new construction between wood joists,
material with labor,

Type 6-S*i* under 9½¢ sq. ft.
Type 4-S*i* under 7½¢ sq. ft.

Infra Insulation Inc., Dept. H-3
525 Broadway, New York, N. Y.
☐ Please send FREE U.S. Bureau of Standards Booklet BMS63
☐ Please send samples
Name________________
Firm________________
Address________________

INFRA INSULATION, INC., 525 Bway., New York, N. Y. WOrth 4-2248

mometer permits the thermometer proper to be removed without leaving an opening in the line or other apparatus. The sockets are threaded for both ½ and ¾ in. NPT. Conducting medium between the inner wall of the stem and the thermometer bulb is powdered aluminum.

Manufacturer—Precision Thermometer & Instrument Co., 1434 Brandywine St., Philadelphia 30.

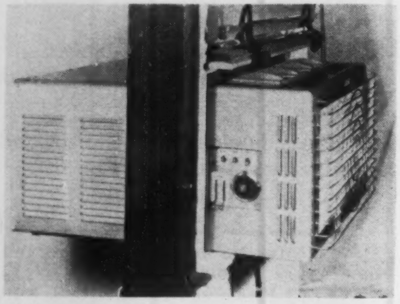
Cork Insulation for Pipes

Cork pipe insulation for use on dual temperature lines where moderate service conditions prevail. . . .Called "LT-30 Cork Covering," the insulation is applied by wrapping it around the pipe. It is designed for use on air conditioning systems and on chilled water and other cold lines where the liquid temperatures in the line are 30 F or above, and relative humidity of the surrounding air does not exceed 70 percent. On the hot water cycle, the covering is said to withstand temperatures up to 200 F. The covering is made of corkboard adhered to a three-ply vapor-proof paper. In application, adhesive is applied to the overlap and the area it will cover. The covering is wrapped around the pipe and the lap pressed into position.

Manufacturer—Armstrong Cork Co., 4400 Concord St., Lancaster, Pa.

Radiant Heating and Cooling Unit

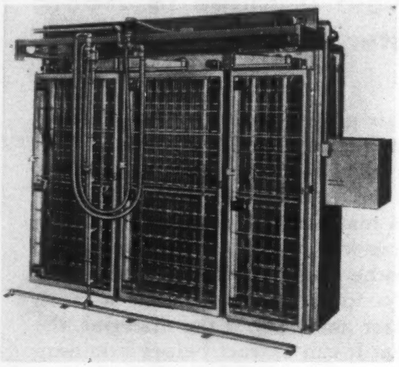
Air conditioning unit with glass radiant heat panel. . . .Known as "Twin-Features," it may be wall or window mounted. It is controlled by three switches for ventilating, air conditioning and heating action and has a thermostat designed to maintain any desired year 'round temperature. The unit utilizes a ¾-ton hermetically sealed compressor and an electrothermal glass panel, shielded by a decorative grille, said to attain a maximum of 440 F with consumption of 1500 watts.



Manufacturer—Electriglas Corp., Bergenfield, N.J.

Electronic Precipitator

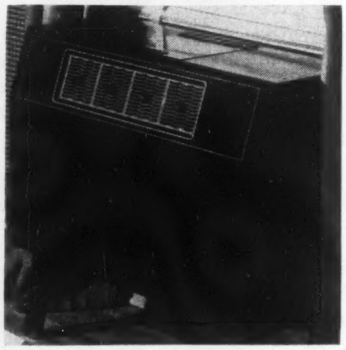
The "Electro-Cell" electronic precipitator redesigned to provide semi-automatic reconditioning of the collector plates . . . The recently developed "Type H Washer" washes the collector plates with water sprays and recoats them with a dust holding adhesive. The washer consists of a vertical header attached to a carriage that travels on an overhead trackway extending the full width of the precipitator. The header comprises separate water and oil lines with uniformly spaced nozzles. The assembly moves across the precipitator twice on the washing cycle, and after a five minute drying period, sprays the collector plates with adhesive.



Manufacturer—American Air Filter Co., Inc., 373 Central Ave., Louisville 8, Ky.

Room Air Conditioners

New 1954 line of room air conditioners includes 17 window units, four consolettes and one water cooled console . . . . The air conditioners feature adjustable window mounting to permit installation of the unit flush or nearly flush to the window sill. Models range from 1/3 to 2 hp. Deluxe models include a reverse-cycle unit that heats or cools and an automatic temperature control that prevents overcooling by restricting the flow of the refrigerant.



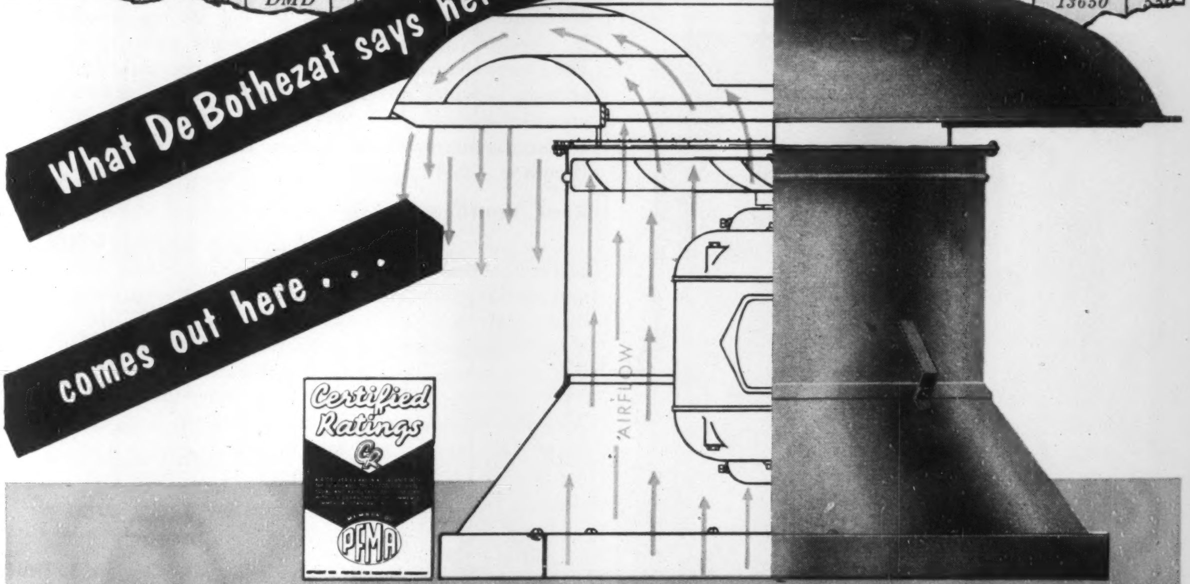
Manufacturer—The Philco Corp., Tioga & C Sts., Philadelphia 34.

Steam Reducing Valve

Pilot-operated steam reducing valve, No. 933. . . . Downstream pressure is sensed by the diaphragm of the pilot valve. The pilot uses upstream pres-

TABLE OF CERTIFIED CAPACITY RATINGS

Motor HP	Fan RPM	Tip Speed	Drive	SP 0″	SP 1/8″	SP 1/4″	SP 3/8″	SP 1/2″	SP 5/8″	SP 3/4″	SP 7/8″	SP 1″	Net Wt.
1	1140	8060	DMD	7125	6750	[illegible]	5900	5375	4800	4150	3500	2750	352
1-1/2	1140	8060	DMD	9400	9100	[illegible]	[illegible]	7750	7175	6200	3850	3400	395
2	1140	8060	DMD	10200	[illegible]	[illegible]	[illegible]	8575	8075	4450	3600	2900	400
5	1750	12380	DMD	13150	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	11500	11180	470
[illegible]	[illegible]	[illegible]	DMD	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	13650	550



GET ALL THE AIR YOU PAY FOR

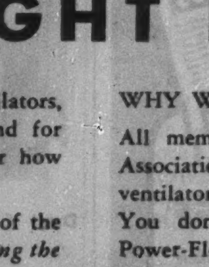
. . . RIGHT NOW!

Next time you buy or specify roof ventilators, consider their cost in terms of CFM. And for your own protection, ask the manufacturer how he arrives at ventilator capacity ratings.

DeBothezat capacity ratings are the output of the completely assembled roof ventilator, *including the head.* These ratings are obtained from wind tunnel tests conducted in accordance with NAFM Standard Test Code Bulletin number 110, Plate VIA. They conform with U. S. Dept. of Commerce Standard 178-51, which embodies the test codes of ASHVE, NAFM and PFMA.

WHY WAIT?

All members of the Power Fan Manufacturers Association have agreed to begin rating their roof ventilators this way within the next twelve months. You don't have to wait, though. DeBothezat Power-Flow Roof Ventilators are already so rated, and have been for years. Specify DeBothezat NOW and get all the air you pay for.



Send for free catalog . . .

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. HPAC-354, East Moline, Illinois

Send Catalog DR-3-53 containing certified ratings and complete data on Power-Flow Roof Ventilators.

FIRM NAME

ADDRESS

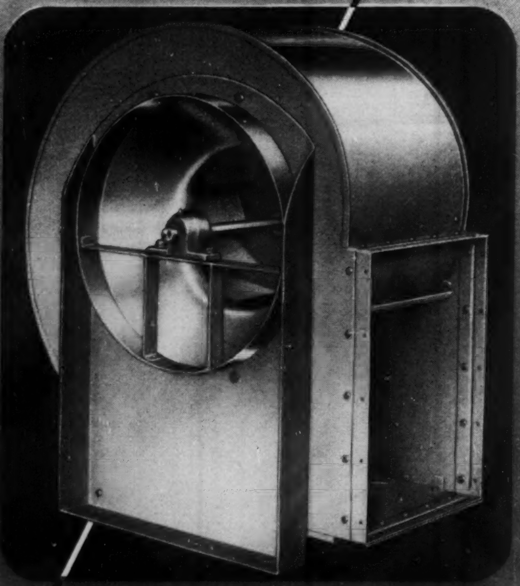
CITY ZONE STATE

NAME AND TITLE

DeBothezat Fans

Division of American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

ALADDIN
FANS



for built-in quality

CERTIFIED RATINGS
Certified ratings are the result of tests made by the Manufacturer in accordance with the Standard Test Code for Centrifugal, Axial, and Propeller Fans adopted jointly by the National Association of Fan Manufacturers and the American Society of Heating and Ventilating Engineers.
AUTHORIZED BY
NAFM
© [illegible] NATIONAL ASSOCIATION OF FAN MFGRS., INC.

- RUGGED
- DEPENDABLE
- CERTIFIED RATINGS

You will find that ALADDIN Fans are available in many types . . . each ruggedly built and fully equal to the job for which it is intended. Thousands of ALADDIN Fans are now in service meeting the air-handling requirements of every essential industry, from chemical to aircraft, on farms and aboard ships.

More and more architects and engineers have come to know ALADDIN Fans . . . and to recognize their merits of quality and dependability.

Write for complete data

ALADDIN HEATING CORPORATION
1111 WEST AVENUE 137 · SAN LEANDRO, CALIF.
REPRESENTATIVES IN ALL PRINCIPAL CITIES IN THE WEST

EQUIPMENT DEVELOPMENTS . . .

[Continued]

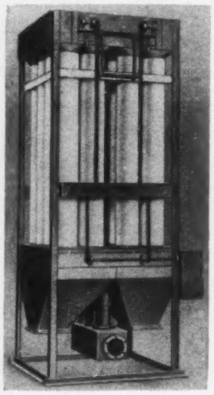
sure to open the main valve if downstream pressure is too low; if too high, it bleeds off the pressure allowing the main valve to close as required. The valve is manufactured in sizes ¾ in. to 6 in. Sizes below 2 in. have bronze bodies; larger sizes are semi-steel. Stainless steel discs and seats are used in sizes 4 in. and smaller; 5 in. sizes are supplied with bronze inner valves and seats. The manufacturer states that the large balanced diaphragm provides positive main valve action without wide pressure variations or sticking.

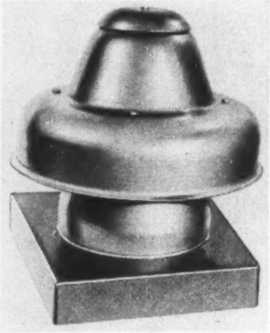
Manufacturer—Klipfel Valves, Inc., 1075 Lincoln Ave., Hamilton, Ohio.

Roof Ventilator

Newly designed power roof ventilator featuring all-aluminum construction. . . .Safety feature is non-sparking fan wheel. According to the manufacturer, backwardly inclined centrifugal fan wheels in sizes from 4 to 36 in. provide capacities from 100 to more than 15,000 cfm, while axial flow fans in sizes from 10 through 36 in. give capacities from 400 to more than 17,000 cfm. Available accessories include automatic and motorized back draft dampers and bird screens.

Manufacturer—W. R. Carnes Co., Verona, Wis.





Above: Ventilator
Left: Collector

Dust Collector

"Amerjet" dust collector, a reverse jet fabric collector designed for applications where extremely fine particles are involved or where the material must be collected in a dry state for reclaiming. . . . The cleaning medium is reconditioned by a jet of high pressure air forced through the cloth in opposite direction to the flow of the air being cleaned. Because the cleaning cycle is continuous, the unit maintains a constant pressure drop and thus a steady air volume at the exhaust points, the manufacturer states.

Manufacturer—American Air Filter Co., 373 Central Ave., Louisville 8, Ky.

Channels for Recirculation in Cooling Towers

Equalizing channels placed between each cell of a cooling tower to balance pressure and reduce recirculation. . . . To prevent exhausted air from being forced downward into the inlet area and recircu-

Here is the NEW

Sterlco
LOW-BOY

CONDENSATE RETURN PUMP

SERIES 5200 Cast Iron TANK
•
Also Available SERIES 5100 Steel Tank

For SMALL LOW PRESSURE APPLICATIONS

- **COMPACT** (less than 1½ sq. ft.)
- **LOW RETURN** (less than 7" from floor)
- **LOW COST** (because of simplicity)

SIMPLE to INSTALL Single electrical connection. Built-in counter-operated switch. One permanent setting for jobs up to 3000 sq. ft. Discharge connection may be rotated to four 90° positions.

SIMPLE to SERVICE No packing glands, rotary seals, O-rings on either pump or switch. Entire pump, motor, and switch unit can be easily lifted out of tank for inspection.

Sterlco THERMOTROL

COLD
NORMAL

Rugged, dependable, automatic, individual radiator temperature control. Easily set to desired temperature—maintains it by modulating the flow of steam or hot water to the radiator in balance with air temperature. Self contained — easily installed without wiring or external connections.

Adaptable to Zone Control in Radiant Heat Systems — ask for details.

STEAM HEATING is MODERN, EFFICIENT and DEPENDABLE

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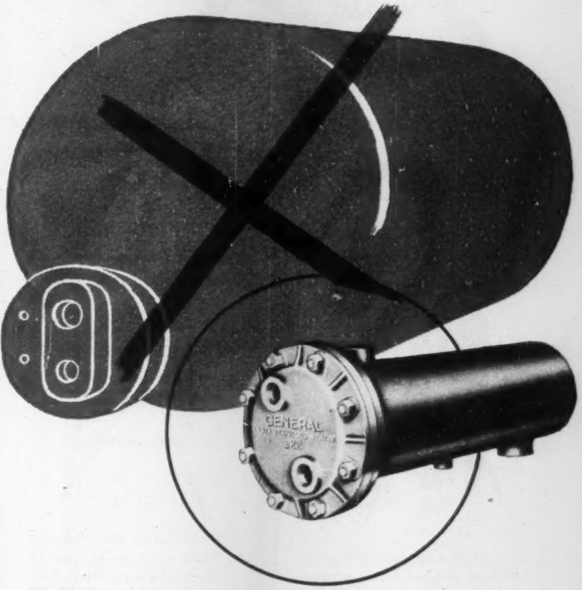
CONDENSATION AND VACUUM PUMPS

HEATING SPECIALTIES

TEMPERATURE CONTROLS

Heat Water the Modern Way ...without a tank



NOW YOU CAN HAVE a continuous hot water supply without installing a bulky storage system. General Instantaneous Water Heaters supply hot water as it is needed, and require a minimum of space. The largest model delivers 300 gpm and measures less than 2 ft. x 7 ft.

Installation is simple . . . whether on the floor or overhead. Merely tap the General Instantaneous Heater into your service line and connect a live or exhaust steam supply for heat source. Periodic maintenance is eliminated. Seamless copper tubing and bronze head and tube plates assure years of "clean" hot water supply.

You'll find a model to fit your needs among 21 sizes of General Instantaneous Water Heaters. Write for Catalog 60. General Fittings Co., Dept. A, 123 Georgia Ave., Providence 5, R. I.

GENERAL FITTINGS COMPANY

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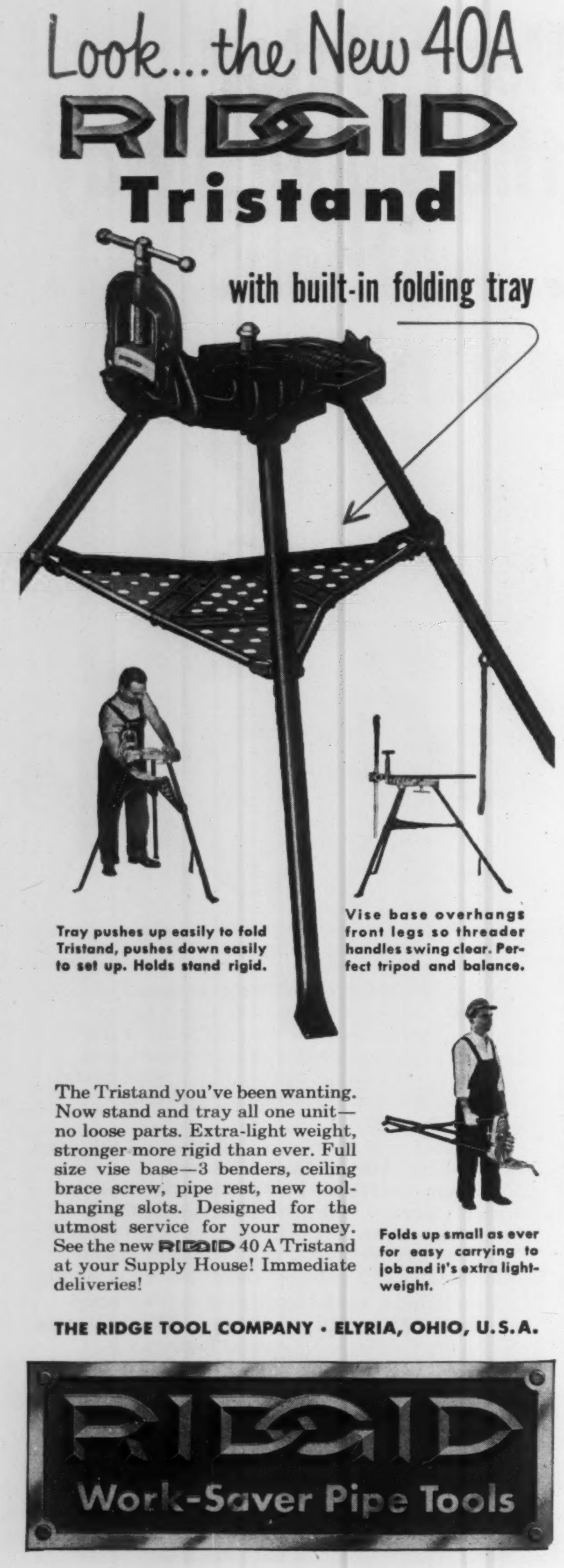
INSTANTANEOUS WATER HEATERS



Look... the New 40A RIDGID Tristand

with built-in folding tray

Tray pushes up easily to fold Tristand, pushes down easily to set up. Holds stand rigid.

Vise base overhangs front legs so threader handles swing clear. Perfect tripod and balance.

The Tristand you've been wanting. Now stand and tray all one unit—no loose parts. Extra-light weight, stronger more rigid than ever. Full size vise base—3 benders, ceiling brace screw, pipe rest, new tool-hanging slots. Designed for the utmost service for your money. See the new RIDGID 40 A Tristand at your Supply House! Immediate deliveries!

Folds up small as ever for easy carrying to job and it's extra lightweight.

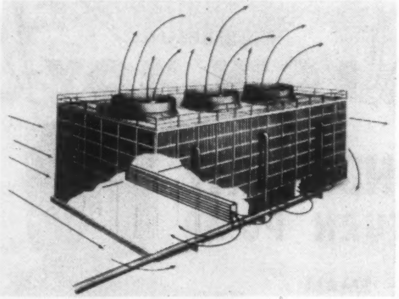
THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID Work-Saver Pipe Tools

EQUIPMENT DEVELOPMENTS . . .

[Continued]

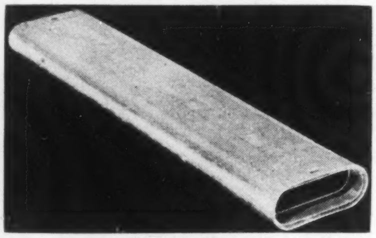
lated through the tower, the manufacturer has introduced equalizing channels into large, multi-cell towers to relieve the pressure differential existing between the windward and leeward sides. According to the company, pressure is equalized on both sides of the tower and during the presence of strong horizontal winds the channels are designed to allow air to pass through the tower in order to equalize pressure.



Manufacturer—Santa Fe Tank & Tower Co., 5401 S. Boyle Ave., Los Angeles 11.

Gas Vent Pipe

Gas vent pipe designed for "in-the-wall" venting. . . . Called "Wall Vent Metalbestos," the pipe has a narrow, oval cross section to permit installation inside a wall without special construction or extra insulation. It features an inner and outer pipe separated by an insulating air space. A "Fastloc" coupler enables pipe section to be joined without cement or mastic, and without screws except where the vent will be left exposed. The outer pipe is galvanized steel and aluminum is used for the inner pipe.



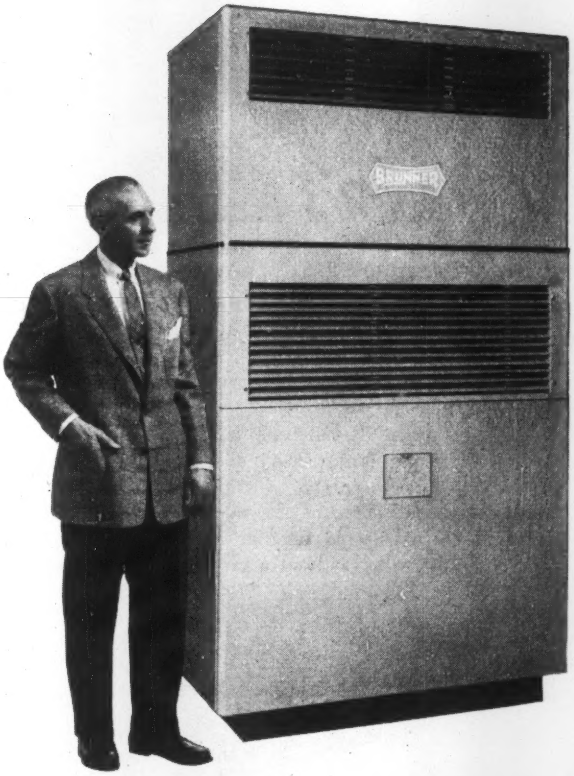
Manufacturer—William Wallace Co., Metalbestos Div., Belmont, Calif.

Heavy Duty Oil Burner

Heavy duty pressure atomizing commercial oil burner. . . . The new burner, known as "Model C-1-A," for firing CS No. 2 or lighter fuel, is available in capacities ranging from 4 to 8 gph. The burner is built around a cast iron fan housing with external adjustments provided for the atomizing nozzle position and position of the air diffuser assembly. This is designed to permit adjustments to be made while the burner is in actual operation. It is equipped with a totally enclosed, permanently lubricated, ball bearing motor.

more in '54 **PACKAGED AIR CONDITIONERS**

GOOD THINGS come in these large "packages"



NEW BRUNNER AIR CONDITIONERS

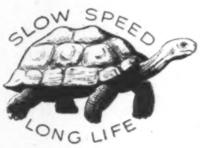
—— in a variety of models for within-room or duct installation, are available in 2, 3, 5, 7½, 10, 15 and 20 H.P. sizes. Completely self-contained, easy to install, easy to service.

There are several good things you'll like about the new line of Brunner "packaged" Air Conditioners. One thing, of course, is the full range of sizes and models which permit wide freedom in application planning. The simplicity of installation is welcomed, too — plenty of savings there.

And — another good thing about *all* Brunner Air Conditioners is the famous Brunner slow-speed condensing unit that means longer service life, less maintenance, lower operating costs—greater satisfaction all around for you—and your customers. In sizes up to 20 H.P., these Brunner packaged conditioners are engineered for *dependability* and trouble-free performance.

See these outstanding Brunner Air Conditioners . . . see *all* the "good things" in this great packaged line for 1954 . . .

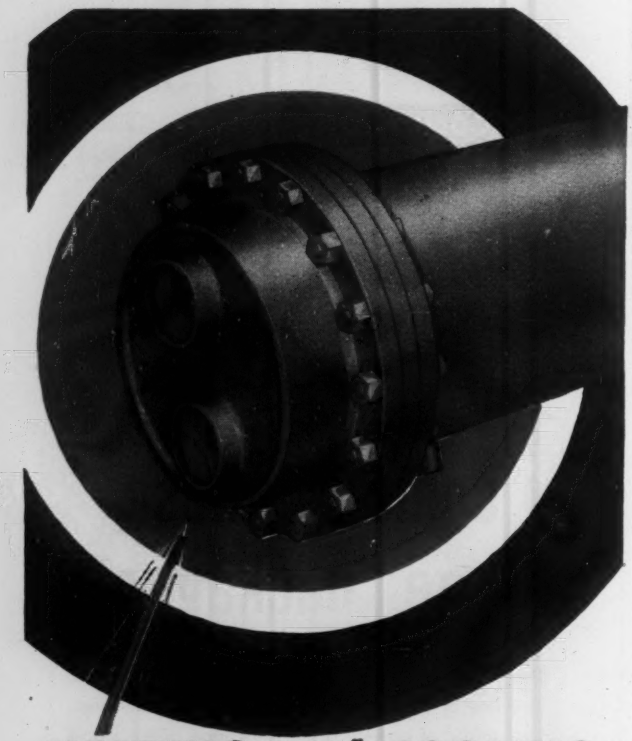
BRUNNER MANUFACTURING CO., Dept. L-34, UTICA, N.Y.
The Brunner Co., Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Limited, Toronto, Ontario



BRUNNER SINCE 1906 means more in '54

As seen in The Saturday Evening POST

BRUNNER AIR CONDITIONING IS ADVERTISED IN THE SATURDAY EVENING POST



HEATING and COOLING EQUIPMENT at its RUGGED DEPENDABLE BEST!

—CONDENSATE COOLERS —WATER CHILLERS —FREON CONDENSERS—FUEL OIL HEATERS CONVERTERS—INSTANTANEOUS WATER HEATERS

Top quality design and construction assure you of long life, plus low operating and maintenance cost with Manning & Lewis heating or cooling equipment.

Standard sizes and models are available for most applications, as well as being furnished of material for normal operating service. Special conditions will be satisfied by M & L engineers upon information submitted by mail or directly to our field representatives.

Heaters or coolers will be supplied to A.S.M.E. code requirements upon request.

With Manning & Lewis Heating and Cooling equipment "The initial cost is the last cost."

Literature pertaining to the above equipment immediately available upon your request.

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EQUIPMENT DEVELOPMENTS . . .

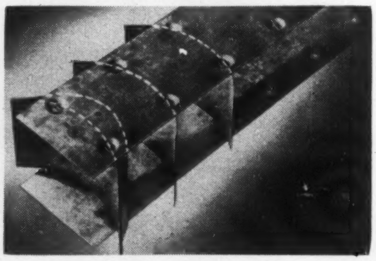
[*Continued*]

Burners are available for use either with stack switch or electronic controls in draft tube lengths of 9, 16 or 22 in. and feature twin nozzles.

Manufacturer—Iron Fireman Mfg. Co., 3170 W. 106th St., Cleveland 11, Ohio.

Vane Runner

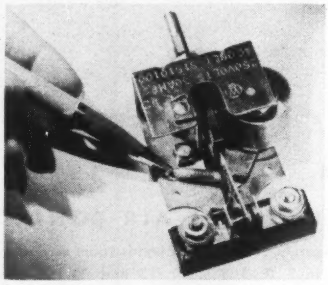
"All-Tite" vane runner for installing vanes in the square elbows of air conditioning and forced air heating ducts. . . . It is made of 24-gage steel and is engineered to accommodate either single or double blades. The company states that vanes are locked in a few seconds and eliminate the need for punching, notching, riveting, spotwelding and layout. The assembled unit is fitted in the elbow and fastened with screws.



Manufacturer—Elgen Mfg. Corp., 41-34 39th St., Long Island City 4, N.Y.

Thermostats for Room Heaters, Conditioners

*"Room-Temp" thermostat for room heaters and conditioners used to control air blast heaters, unit heaters, radiant heat panels, furnaces or air conditioners. . . . One of the main features of the new model is its ability to handle currents as high as 30 amp, 125/250 volts, without a circuit relay or contactor. It can be mounted on the equipment chassis with one or more rivets or screws and has accessible terminals for simplified wiring. Snap-action is designed to eliminate interference in radio and television reception. The thermostat is available with a single pole, single throw, or single pole, double throw.



Manufacturer—Westinghouse Electric Corp., P. O. Box 2099, Pittsburgh 30.

Packaged Air Conditioners

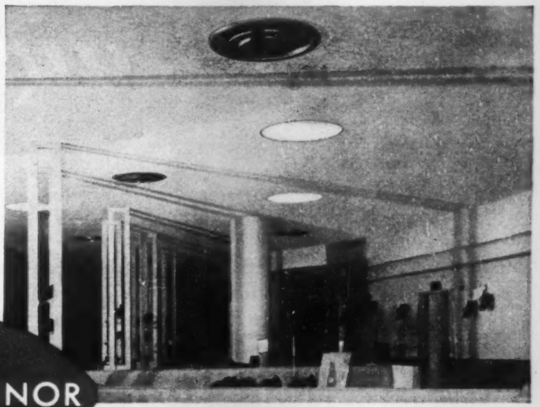
New line of packaged air conditioners. . . . Models for 1954 include three electrically operated

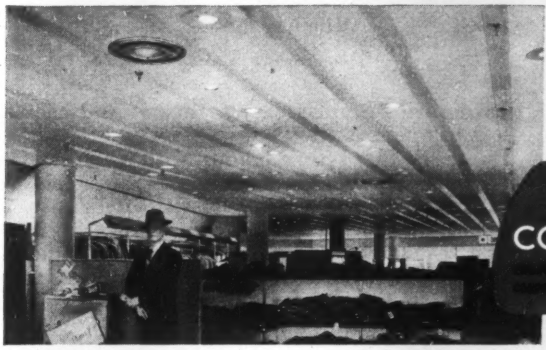
ASSURING COMFORT FOR DEPARTMENT STORE CUSTOMERS

THE HECHT CO., Arlington, Va. (left), relies on Kno-Draft to bring conditioned air into its Parkington-Arlington store. Kno-Draft's post-installation adjustability of air volume and direction reduces preliminary "engineering," maintains exact comfort level.

KAUFMANN'S, Pittsburgh, Pa. (below), gets draftless distribution of air to large open areas through Kno-Draft High Pressure Air Diffusers, Type HPC—using small space-saving exposed ducts, easy to install. Units adjustable from 90 to 180 c.f.m. or may be shut off.

FAMOUS-BARR, St. Louis, Mo. (below), keeps its Southtown store comfortable for customers with regular Kno-Draft Adjustable Air Diffusers. Air circulates without drafts, and changes in store layouts present no problem as Kno-Draft Diffusers are adjustable *after* installation.





HUTZLER'S, Towson, Md. (above), uses special Kno-Draft High Pressure Air Diffusers that permit the air supply in a given area to be changed without unbalancing the air delivery of the other outlets, or creating objectionable noise. Installed cost comparable to conventional system.

STORES, restaurants, office buildings, factories—wherever there is an air distribution problem—will do better with Kno-Draft. For the full story, send for the latest edition of the Kno-Draft Data Book. Use the handy coupon or write Connor Engineering Corporation, Danbury, Conn.

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kno·draft®

adjustable air diffusers

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Dept. G-34, Danbury, Connecticut

Please send me the *new edition* of the Kno-Draft Data Book—without obligation, of course.

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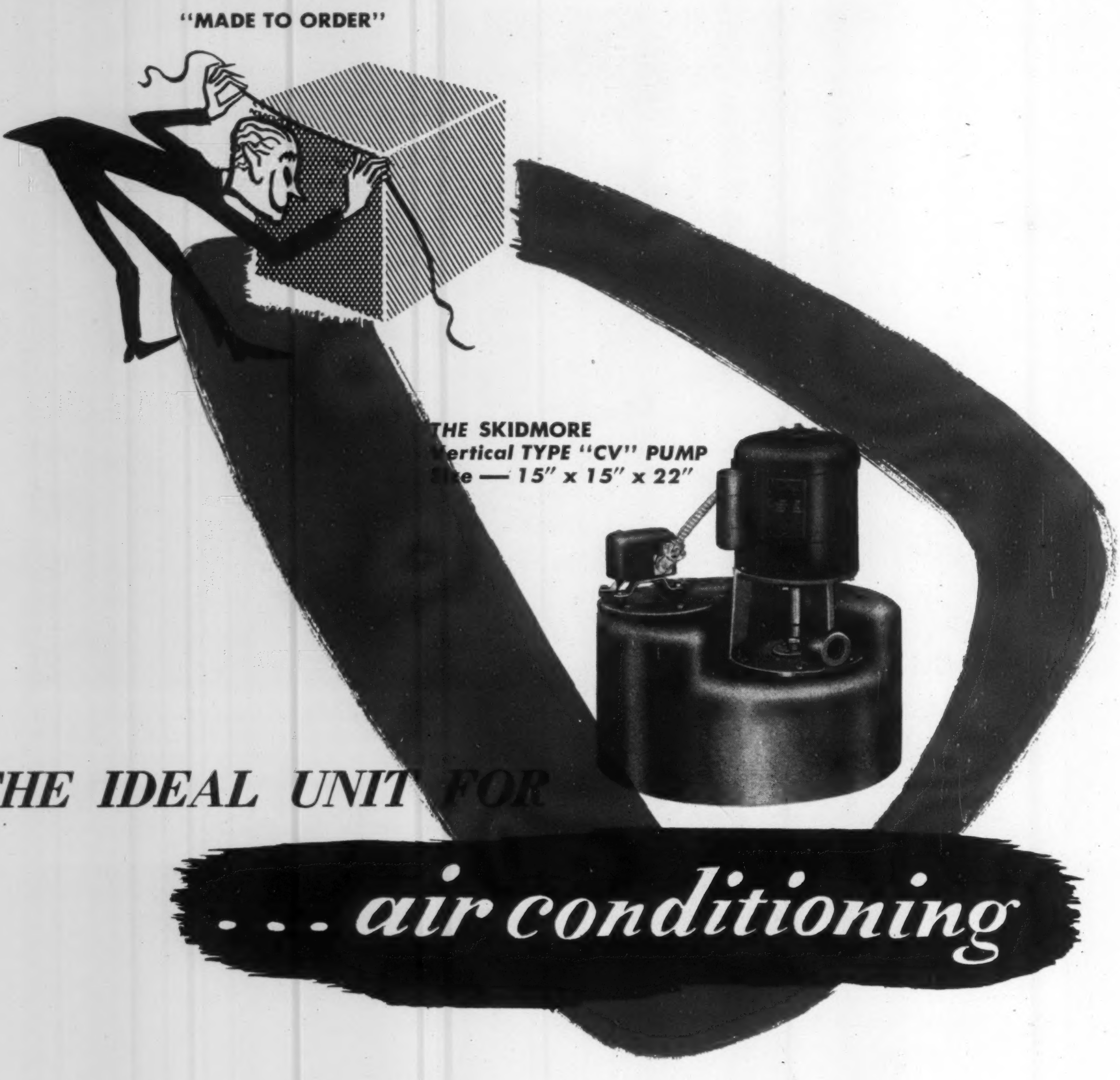
Position ....
Company ....
Street ....
City .... **Zone** .... **State** ....



THE IDEAL UNIT FOR

. . . air conditioning

Compact design — efficient trouble-free performance — The Skidmore "CV" Pump has long been a favorite in the heating pump field. NOW, this pump is winning new popularity, engineers and contractors are specifying the Skidmore "CV" Pump for industrial and commercial air conditioning installations. Requiring a maximum space of 15" x 15" x 22" this Skidmore Pump is easy to install and economical to operate.

Pump is fitted throughout with enclosed centrifugal impeller. Shaft is stainless steel. Self lubricating bronze bearing directly above impeller. Each pump is completely assembled and tested at factory. Call or write today for immediate shipment, or contact your Skidmore representative for full details.

Skidmore Pumps have set a standard of performance and dependability through continual research and development since 1921.

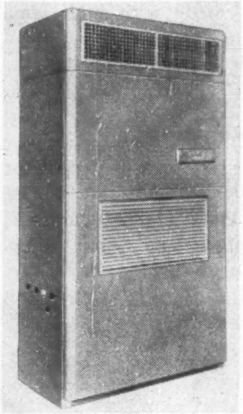
SKIDMORE
PUMPS

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

EQUIPMENT DEVELOPMENTS . . .

[*Continued*]

self-contained air conditioners with cooling capacities of 3, 5 and 7½ tons which can be adapted for winter heating; two casement-type room air conditioners; two



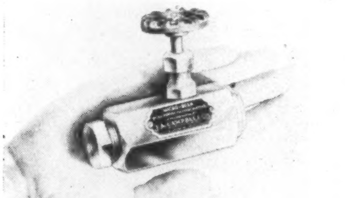
reverse cycle room air conditioners in ¾ and 1 hp sizes; and a ¾ hp flush-type room air conditioner which extends 5 in. into the room.

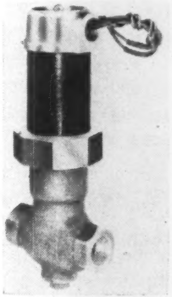
Manufacturer—Servel, Inc., Evansville 20, Ind.

Cast Iron or Steel Solenoid Valves

New line of cast iron and cast steel solenoid valves in sizes from ½ in. to 2 in. . . . Pressures range to 1000 psi at 200 F and 500 psi at 450 F. Designed for handling all media normally injurious to bronze or brass and not harmful to ferrous metals. New engineering features include "stick-free" internal design, stainless steel hooded pilot seat screw for better closing action and "Teflon" disks inert to all media except hot fluorine. Neoprene "O" rings seal joints and prevent leakage.

Manufacturer—Atkomatic Valve Co., Dept. 108, 545 Abbott St., Indianapolis 25, Ind.

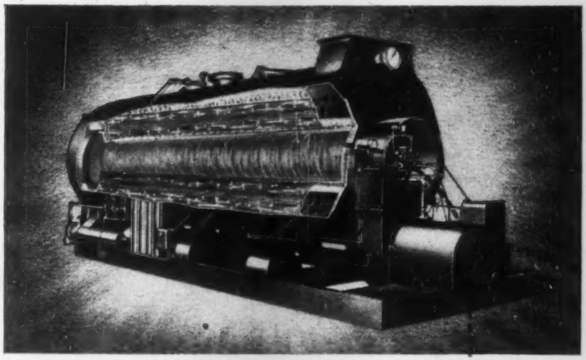




Above: Dampener
Right: Valve

Pulsation Dampener

Improved pulsation dampener to be installed on gage and governor lines. . . . Known as the "Micro-Bean," the device has been redesigned to a shorter length and equipped with a filter of stainless steel to prevent corrosion. The body is all brass for 300 lb operating pressure, or steel with stainless steel for 6000 lb or all stainless steel for 10,000 lb. The valve has a 96 to 1



The POWER of the future!

Cyclonic Combustion!

- The Cyclotherm Cyclonic Combustion Principle is an entirely new and amazingly different method of heat transfer in the boiler industry.

- Air enters the combustion chamber at extremely high velocity in a revolving spiral vortex which travels the entire length of the furnace. The fuel is introduced into the entering air where it is slowly consumed as it moves in a cyclonic motion down the combustion chamber. This highly luminous slow burning flame radiating heat to the fire tube through direct radiation and by convection, results in an unusually high rate of heat transfer.

- *No matter what size the building or job, Cyclotherm has the correct installation. Send for your copy of "All Your Questions Are Answered by Cyclotherm" today and find out for yourself the facts concerning Cyclotherm Steam Generators.*

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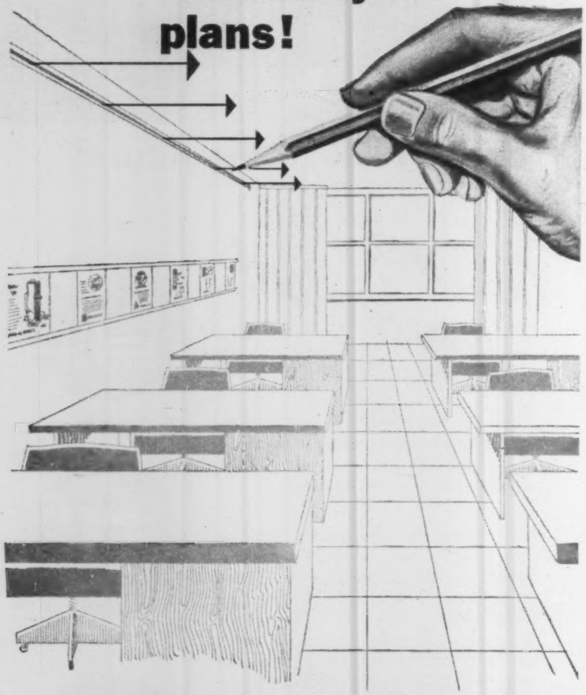
See how **inconspicuously** STRIPLINE fits into your plans!

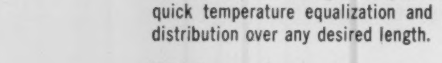


Unlimited air distribution provided by slender continuous diffusers ...another AGITAIR first!

Stripline diffusers offer complete application versatility. They are ideal for installation in shallow lighting coves...window stools for air curtaining of glass windows or exposed wall areas...side of furred beams... or as a decorative border blanketing the entire area with noiseless, draftless air distribution. Custom built with AGITAIR's patented diffusing vanes, Stripline diffusers create maximum mixing and aspiration... quick temperature equalization and correct air distribution over any desired length.

Write for your free copy of Catalog S-100 today.

AGITAIR STRIPLINE



AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.
AIR DIFFUSERS • FILTERS • EXHAUSTERS

EQUIPMENT DEVELOPMENTS . . .

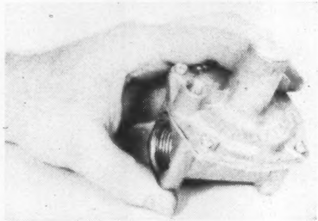
[Continued]

taper to eliminate stem and screw compensation strain. According to the company, when installed ahead of a gage or governor, jitters of the gage pointer are minimized, pulsation is dampened and the line flow is smoothed. It is made with both female threads, 1/4 or 1/2 in.

Manufacturer—J. A. Campbell Co., 645 E. Wardlow Rd., Long Beach 7, Calif.

Gas Pressure Regulator

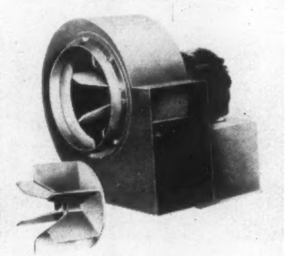
Gas pressure regulator, "Model RV-41," with improved lock up and pilot flow regulation . . . . The company states that it is designed for normal operation with a vent breather hole which will pass less than 1 cu ft per hr in case of diaphragm failure. It is said to be capable of controlling pilot flows only when all the burners are shut off, but has adequate capacity for the full range input. It is used for industrial burner pilot controls, water heaters, wall heaters, room heaters, etc.



Manufacturer—Maxitrol Co., 12200 Beech Rd., Detroit 28.

Kitchen Hood Exhauster

Commercial kitchen hood exhauster designed for continuous duty with 8, 9 and 10-in. ducts. . . . The unit is built in 1/6, 1/4 and 1/2 hp sizes with 1750 rpm motors. One of the features is a cast aluminum, self-cleaning wheel. It is dynamically balanced and can be turned for the type of discharge desired. The company states that it will not load up with grease or dirt to retard air flow. The unit has resilient mounting, automatic thermal overload protection and sleeve bearings. Drive covers are available for outside installations.



Manufacturer—The Peerless Electric Co., Fan and Blower Div., 1401 W. Market St., Warren, Ohio.

Insulation for Instrument Wiring

Moisture-proof, high-voltage insulation for internal wiring of electronic instruments. . . . The

EQUIPMENT DEVELOPMENTS . . .

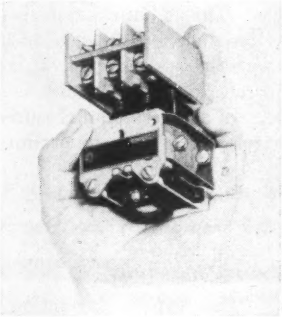
[*Continued*]

new insulation, a thermoplastic material, is said to be impervious to moisture and is recommended for use where high humidity conditions prevail. For identification, the insulation comes in 10 base colors. Where tracers are required, the insulation is white with two identically colored helical stripes to identify the base color and a third stripe to show the tracer color. Input circuit wiring is solid white covered by color-coded rayon braid.

Manufacturer—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves, Philadelphia.

Magnetic Contactors

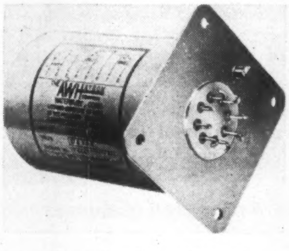
"Little Giant" magnetic contactors rated up to 5 hp at 208-550 volts. . . . They are furnished in 2, 3 or 4 poles. The manufacturer states that a wide contact gap, 21/64 in., is advantageous in reversing contactors to avoid flashover during rapid reverses. The company recommends them for uses in air conditioning and heating units, hoists, door openers, packaging and baling machines, mobile cranes and ovens. They are said to be adaptable to applications requiring a compact magnetic switch for intermittent or continuous duty.

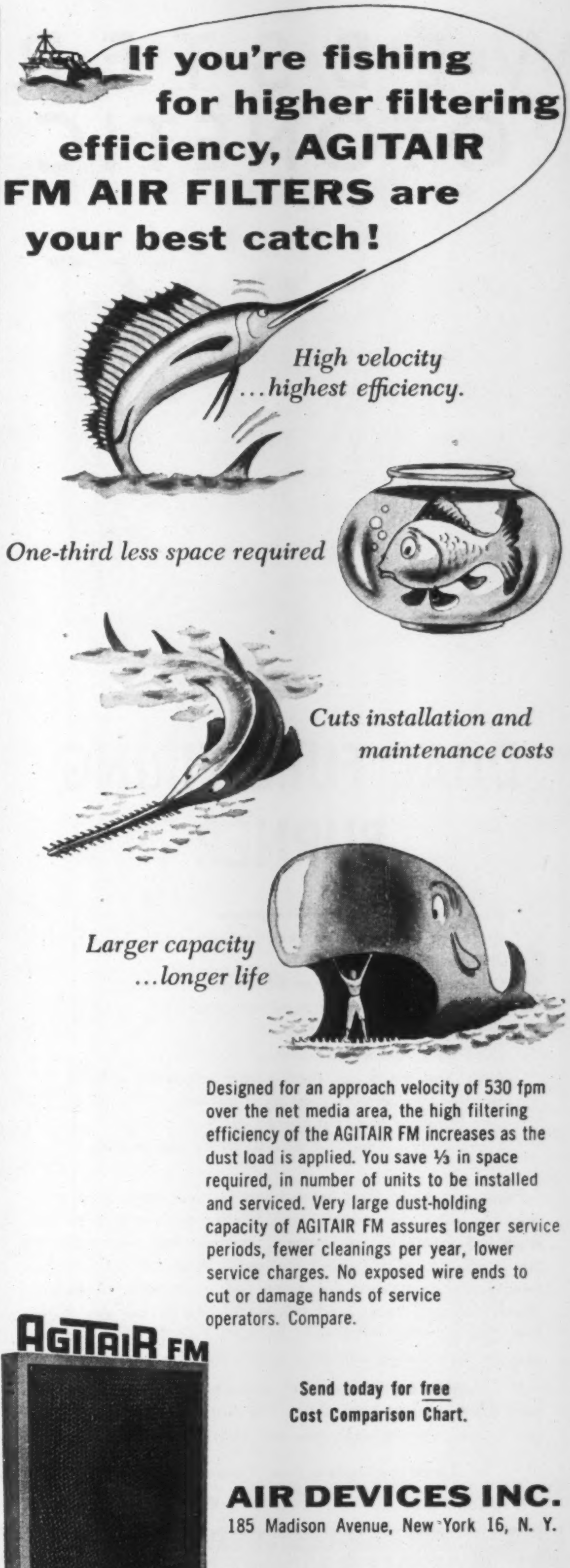


Manufacturer—Furnas Electric Co., 1041 McKee St., Batavia, Ill.

Miniature Time Delay Relay

Hermetically sealed time delay relay. . . .Designed to take up less space than previously required, the relays can be supplied with 50, 60 or 400 cycle a-c or governed or standard d-c motors. The unit is enclosed in a lightweight aluminum hermetic housing, 2½ in. in diameter. The basic length for a single switch unit is 2 15/16 in. Governed or filtered motors, special or extra switches increase this dimension slightly. Three-stud or flange mounting is available. Electrical connection can be made with a glass seal header or AN connector.

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High velocity ...highest efficiency.
One-third less space required
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AGITAIR FM

Designed for an approach velocity of 530 fpm over the net media area, the high filtering efficiency of the AGITAIR FM increases as the dust load is applied. You save ⅓ in space required, in number of units to be installed and serviced. Very large dust-holding capacity of AGITAIR FM assures longer service periods, fewer cleanings per year, lower service charges. No exposed wire ends to cut or damage hands of service operators. Compare.

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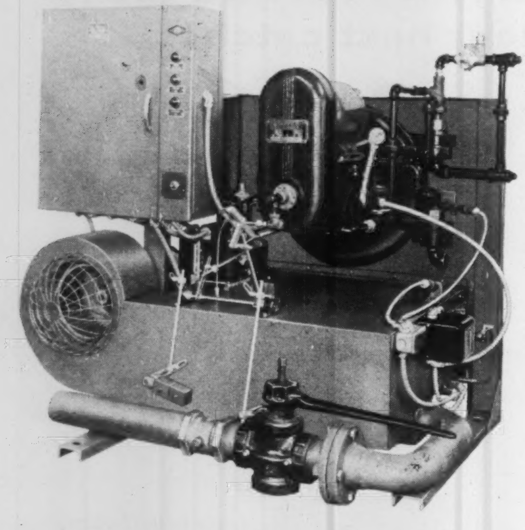

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BURNER

√ **Sizes from 75 to 300 horsepower.**
√ **Minimum gas pressure requirements.**
√ **Low installation costs.**
√ **Maximum efficiencies on BOTH gas and oil.**
√ **Minimum base height requirements.**
√ **Utilizes all grades of fuel oil.**
√ **Extremely low noise level.**
√ **Approved electronic combustion safeguard system.**
√ **Simpler changeover than ever before.**
√ **One hundred per cent forced draft.**
√ **Completely assembled, piped, wired and tested.**

These and many other outstanding features combine to provide the same dependable high quality performance as the WEBSTER DYNETIC gas burner. Neither fuel must suffer if the WEBSTER ROTONETIC is used. With integral pumps, integral oil preheaters for heavy oils, patented oil burner "flame-shaping" vanes, and full modulating or optional high-low control, the WEBSTER ROTONETIC is designed to provide long lasting customer satisfaction the year around.

It is furnished with a precast refractory front as an integral part of the burner assembly. The installer need only finish the furnace wall on each side and above the burner.

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The WEBSTER ENGINEERING COMPANY
TULSA, OKLAHOMA
Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

EQUIPMENT DEVELOPMENTS . . .

[Continued]

Manufacturer—The A. W. Haydon Co., 232 N. Elm St., Waterbury, Conn.

Pressure Rated Plastic Pipe

"PressuRated" plastic pipe packed in a new cardboard dispensing carton . . . . The piping is made with pressure ratings of 75, 100 and 125 lb in sizes $\frac{1}{2}$ in. through 2 in. The specified working pressure is the same in all sizes. The rating is stamped on every length of pipe.

Manufacturer—Yardley Plastics Co., 138 Parsons Ave., Columbus 15, Ohio.

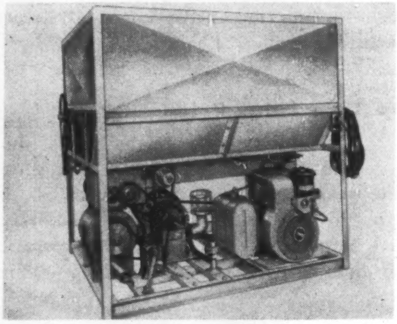
Baseboard Radiation

Re-designed line of baseboard radiation includes a special punching along the metal back of the baseboard to permit hanging the radiator supports without the use of screws or tools . . . . Finger pressure bends forward the prepunched portions of the back before the baseboard is installed. The radiator supports are slipped into place after the baseboard has been installed. Another design change is the addition of a larger tube size. Where greater heat carrying capacity is desired, a 1-in. tube is available. In addition, end closures are now being fabricated with removable tops to permit access to vents and valves.

Manufacturer—Bush Mfg. Co., 179 South St., West Hartford 10, Conn.

Insulation Blowing Machine

"Uni-Matic" insulation blowing machine. . . . The machine employs a newly developed, four-speed conveyor metering system designed to automatically feed a pre-determined amount of material to the shredder. The manufacturer states that the machine offers a choice of several usable operating speeds and remote control of the mechanism by the hose man. The hopper holds 15 to 18 bags.

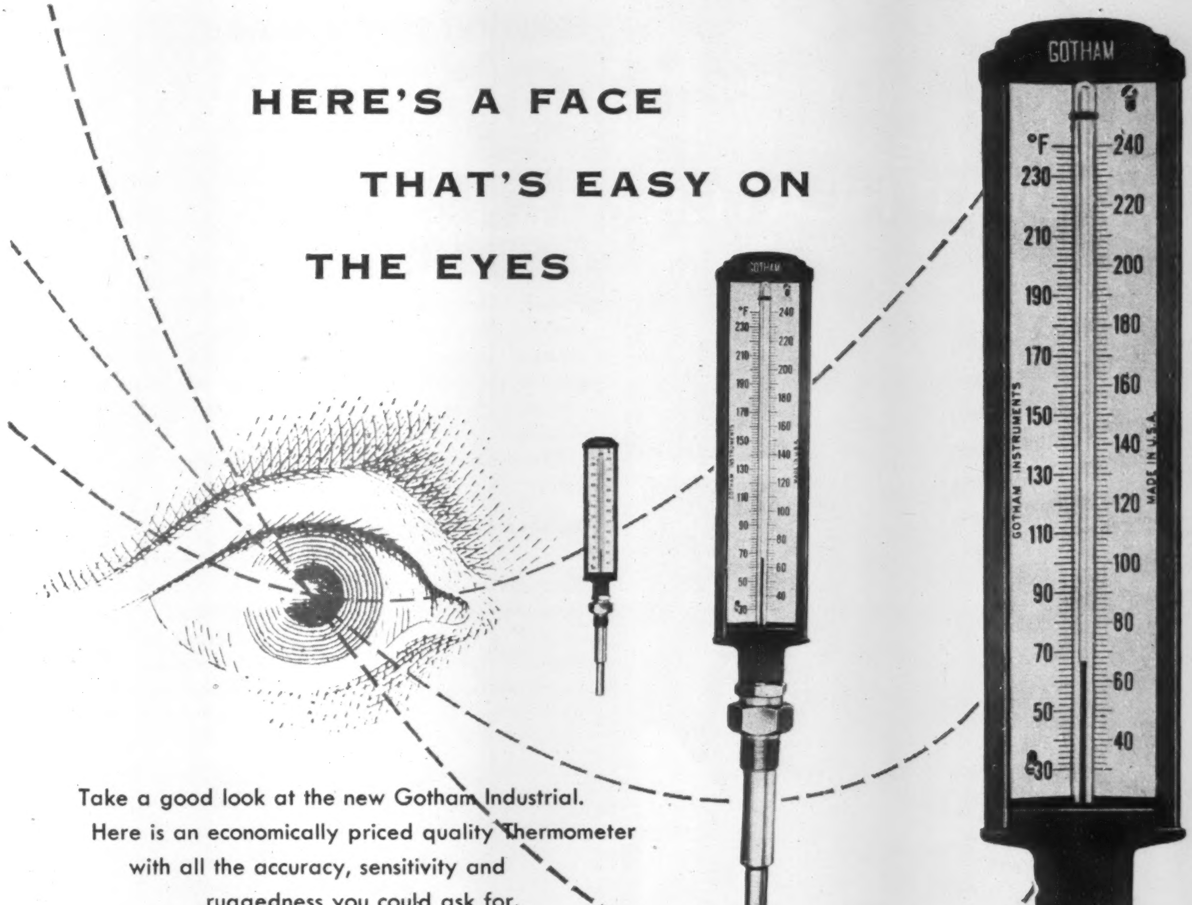


Manufacturer—Universal Insulating Co., Dept. 16, 333 S. Walnut St., Van Wert, Ohio.

Calculator for Areas and Volumes

Pocket-size calculator for finding areas of walls, windows, ceilings, floors and volumes to the nearest sq ft. . . . Operating like a slide rule but reading like a table, the vinyl plastic calculator determines areas to the nearest sq ft and volumes in cu ft. Window areas

HERE'S A FACE THAT'S EASY ON THE EYES



Take a good look at the new Gotham Industrial. Here is an economically priced quality Thermometer with all the accuracy, sensitivity and ruggedness you could ask for.

The new Gotham design features a shallow, "V" shaped case, made of extruded brass. Its scale is wider and flatter, permitting better visibility and promoting greater reading accuracy from all angles. Its heavy cover glass is held firmly in place by a channeled rubber-over-brass gasket, making the unit moisture-proof, dust-tight and more rugged. Its red reading glass tube is carefully selected, heat treated, and filled with triple distilled mercury for truer accuracy.

Gotham Industrial Thermometers are furnished in straight or angle forms between —40°F and 950° F. Centigrade and Reamuer equivalent scales are also available. Sizes: 7", 9" and 12". Write today for full information. United States Gauge, Division of American Machine and Metals, Inc., Sellersville, Pa.

Quality Gauges Engineered for Enduring Accuracy

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Mueller Climatrol

TYPE 160
GAS UNIT HEATER

NEW!
New design, new efficiency. A.G.A.-approved for natural, manufactured, mixed, and propane gas.

MORE EFFICIENT!
Designed for real heating economy — longer life, minimum maintenance.

EASY TO INSTALL!
Shipped pre-wired and pre-assembled. Easy to hang.

. . . EIGHT SIZES FROM 50,000 TO 225,000 BTU INPUT IN INCREMENTS OF 25,000 BTU

Any way you look at it, this Mueller Climatrol has what it takes to help you fill the bill for unit heater applications of the unit-heater business in stores, garages, factories and other commercial establishments. Check these features:

Compact — only 29½" x 19½" x 12" (for the 50,000 Btu size.)

High Crown Sheet — no "hot spots", no joints or welds exposed to flame.

Welded-Steel, Air-Tube-Type Heat Exchanger — for maximum heat extraction, efficiency, *longer life*.

Quiet Fan — propeller type, properly pitched for even air distribution.

Cast-Iron Drilled-Port Burner provides even heat distribution over entire hearth area.

Built-In Diverter with rear flue outlet — adjustable louvers. Enclosure for burner and controls is optional.

Smooth Finish in cool Mountain Spring Green color, easy to repaint to match room decor.

These and many other features add up to ready acceptance of the Mueller Climatrol Type 160 Unit Heater by engineers, architects and builders.

Write for facts and figures that tell you more about this newest Mueller Climatrol.

Mueller Climatrol 97th

D-152E

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EQUIPMENT DEVELOPMENTS . . .

[*Continued*]

—either by opening size or glass size—can be found by means of the sliding sleeve on the device.

Manufacturer—Paul S. Morton Engineering Service, 609 Bangor Rd., Lawrence, Mich.

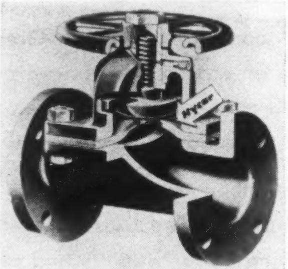
Pipe Thread Compound

Chemically resistant thread sealing compound, "Flexrock 25, Teflon Pipe Dope". . . . It is recommended for use on chrome, chrome plate, nickel steel, ceramic and plastic pipe threads and for joining or connecting dissimilar materials. Its lubricating qualities are said to prevent galled threads and permit easy pipe joining.

Manufacturer—Flexrock Co., Packing Div., 3603-K Filbert, Philadelphia 1.

Rubber Diaphragms for Valves

Valves with "Hycar American" rubber diaphragms recommended for service requiring resistance to acids, oils, heat and many chemicals . . . . Materials controlled by the valves include sulfurous and oleic acids, glycols, aliphatic and aromatic hydrocarbons, "Freon 12," vegetable and animal oils, low pressure steam and common gases. The valves effect leakproof closure by pressing a flexible diaphragm against a transverse weir. Besides controlling the flow of material, the diaphragm seals and protects the valve stem and other working parts, the manufacturer states.



Manufacturer—Hills-McCanna Co., 3023 N. Western Ave., Chicago 18, Ill.

EQUIPMENT BRIEFS . . .

HAND MODEL BLOW TORCH with disposable fuel tank . . . . Complete with all brass burner and fittings, it is designed for soldering, light brazing and similar jobs where heavy duty equipment is not required.

Manufacturer—The Turner Brass Works, Sycamore, Ill.

HEAVY DUTY INDICATING LIGHTS which are oiltight and are designed for the company's line of oiltight pushbuttons, selector switches and accessory controls . . . . All glass faceted lenses of the lights are factory sealed to metal caps, and feature all angle visibility. They are available in three forms: resistor, transformer and full voltage.

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N. Y.

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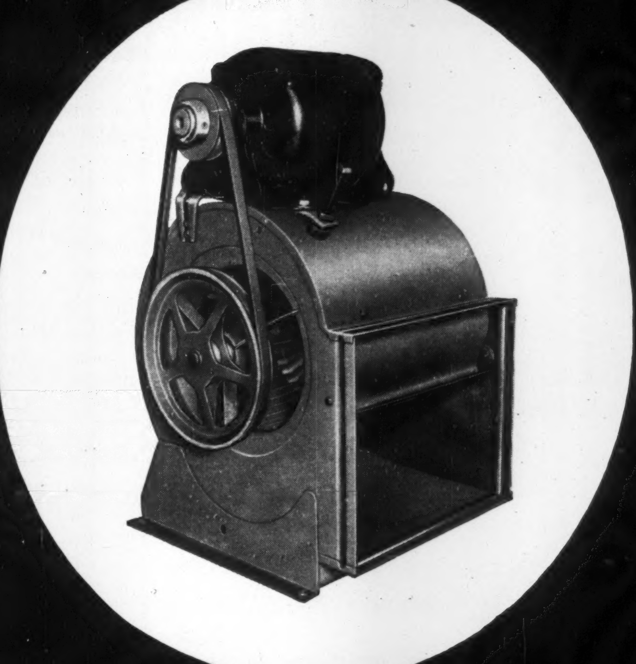

LAU

Series "A" Blower Assembly

The Belt Driven Blower Assembly that leads the field! Dozens of outstanding features for superiority of performance and long, trouble-free life.

Housing Base of rigid, heavy gauge steel.
Discharge Outlet of improved design and construction.
Belt and Shaft, 2 stage centerless ground and burnished shafting, custom-built belt.
Bearing Bracket, 3 point suspension.
Pulley, improved LAUsteel for strength and performance.
Wheel, center suspension for high and low speed.
Bearing Assembly, LAU porous metal, self aligning.
Motor Mounting, permits ANY motor location, strongest of any blower motor mounting.
Plastic Washer, absorbs shocks, assures quiet operation.
Capacity Range, 350 to 22,000 c. f. m.

Complete Ready for Installation

What's your problem? Lau engineering experience and know-how is at your disposal. Write for catalog 707

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LAU **World's Largest Manufacturers of Air Conditioning Blowers**

Low Silhouetted
PENN VENTILATORS
Keep Air
MOVING at
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Company's
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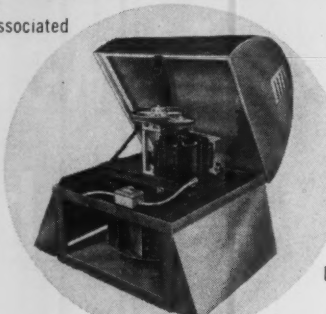
Designed by:
Albert Kahn Associated
Architects &
Engineers



PENN
DYNAFAN

- Twenty-nine Penn Dynafans serve the new International Harvester Company's office and laboratory facilities at Fort Wayne, Indiana. Inconspicuous and easy to maintain, these units are depended upon to move air quietly. Many plant ventilation problems are easily and inexpensively solved by these versatile units. Count on the Penn Ventilator man in your area for qualified and complete assistance on your next ventilation problem.

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RECENT TRADE LITERATURE . .

Automatic Boiler

Four-page folder describes "Powermaster" packaged automatic boilers for steam process and steam and hot water heating service. Constructional and operational advantages are pictured and described. Several installation photographs are reproduced emphasizing various fuel firing arrangements.

Manufacturer—Orr & Sembower, Inc., Morgantown Rd., Reading, Pa.

Blow-Off Valves

Bulletin B-426 contains details of blow-off valves for boiler pressures up to 400 lb WSP. The catalog shows the features of a seatless blow-off valve and a double tightening blow-off valve. Additional information includes installation recommendations, construction details and prices.

Manufacturer—Yarnall-Waring Co., 107 Mermaid Lane, Philadelphia 18.

Control Selection Guide for Motors

The latest selection information on motor starters and pushbuttons is contained in the publication, GEA-6061. The bulletin provides buying information on a-c magnetic motor starters, a-c combination starters, pushbutton stations, a-c manual motor starters, and magnetic reversing controllers. In addition to ratings and suggested prices, the publication contains photos of the equipment, circuit diagrams, and brief application data.

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N.Y.

Diaphragm Motor Valves

Specification Sheet 426 describes the "Series 800, Type 24," high pressure diaphragm motor valves for wide band proportional control. Complete specifications are given for globe bodies rated at a maximum of 3000 psi at 450 F and angle bodies rated at 6000 psi at 450 F.

Manufacturer—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Aves., Station 64, Philadelphia 44.

Drainage Fittings

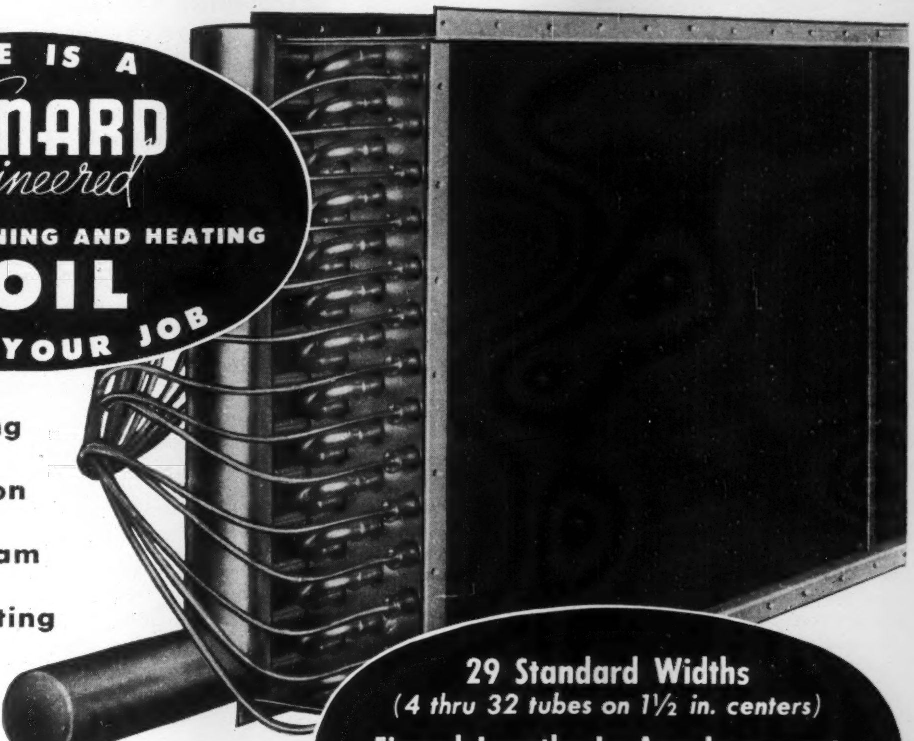
Catalog on cast iron drainage fittings shows sizes, list prices, unit weights, prices per box and weight per box. Additional information contained in the catalog includes a page devoted to the dimensions of cast iron drainage fittings and a page with American Standard taper pipe threads illustrated and charted.

Manufacturer—Union Malleable Mfg. Co., P. O. Box 566, Ashland, Ohio.

Dynamometer Systems

A new bulletin on dynamometer systems for testing internal combustion engines, transmissions, torque converters, rear axle assemblies, pumps, fans, electric motors, compressors, etc., now is available. The 12-page publication, GEA-5923, tells how the company's d-c dynamometer systems can be used for both motoring and absorption applications. Data is provided on the system's speed and torque range.

you can get it at KENNARD!



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Engineered
AIR CONDITIONING AND HEATING
COIL
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Heating-Cooling

Direct Expansion

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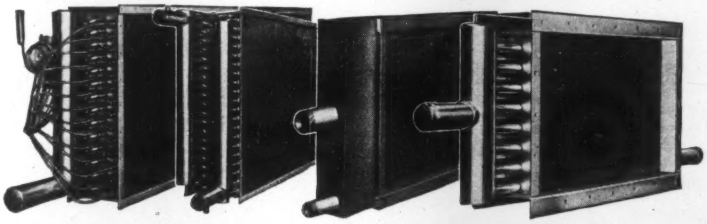
29 Standard Widths
(4 thru 32 tubes on 1½ in. centers)
Finned Lengths In Any Increment
(up to 10 ft.)
Any Number of Rows Deep

Flexibility to meet exacting needs is yours when you specify or order Kennard Engineered Coils.

plus... Hard temper fins, permanently bonded by hydraulic expansion of tube.
High temperature brazing of all tube joints.
Aluminum or Hot-Dipped Galvanized Steel Frames.



EVERY KENNARD REPRESENTATIVE was selected for his know-how and ability to help you solve your air conditioning problems. He's probably your neighbor—write us for name of one nearest you.

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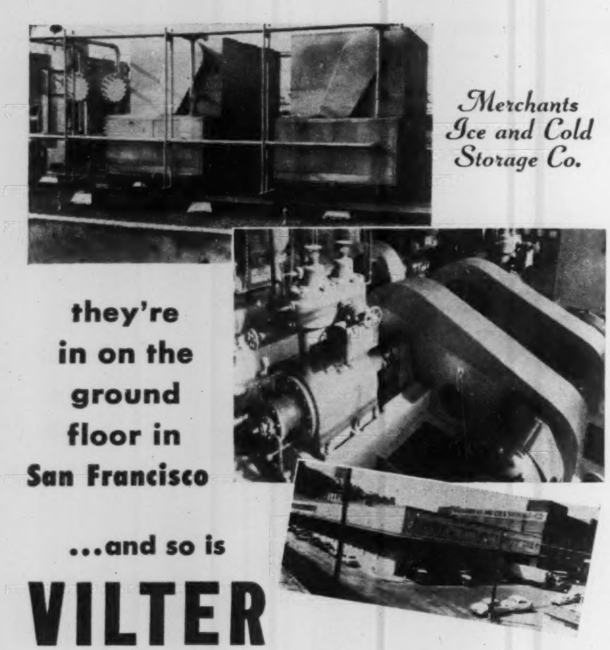

Merchants Ice and Cold Storage Co.

they're in on the ground floor in San Francisco

...and so is

VILTER

Merchants Ice and Cold Storage Company of San Francisco is no Johnny-come-lately to the West . . . they've been doing business there since 1893. "Merchants" is no old fogey, either, since their newly remodeled plant is a model for all that's new in cold storage. Entirely on one floor, the new plant eliminates elevators and manual handling, to cut costs and speed movement in and out of storage. To add to that, office space over the warehouse makes operation convenient for warehouse space lessees.

Two Vilter Vertical Compressors and two Vilter Boosters were installed to handle the load, but they are working so well, and design and construction of the buildings is such that even during the summer one compressor and one booster usually suffice. The Vilter machines operate automatically, and are alternated every two to three weeks to equalize running time. Vilter Shell and Tube Condensers and Vilter Evaporative Condensers help to increase the efficiency of the installation.

There's nothing unusual about a Vilter installation that's economical beyond expectations, because Vilter refrigeration equipment is designed and built—entirely by Vilter—with that extra measure of care that makes the difference between "good" and "excellent." Thousands upon thousands of users of refrigeration all around the country save money on operation and upkeep with Vilter. Probably Vilter can help you save, too.

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Your nearby Vilter Representative or Distributor will be glad to show you how Vilter refrigeration can help cut costs in your plant.

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Air Conditioning • Ammonia & Freon Compressors • Booster Compressors • Baudelot Coolers • Double Pipe Coolers • Blast Freezers • Evaporative & Shell & Tube Condensers • Pakicers • Pipe Coils • Valves & Fittings

RECENT TRADE LITERATURE . . .

[Continued]

Manufacturer—General Electric Co., 1 River Rd., Schenectady 5, N. Y.

Evaporative Condenser

Features of a newly-designed evaporative condenser, "Perma-Fan," are described in this booklet. Photographs and cutaways compare original models with the improved series. Summarized is information on flexibility, maintenance and ratings available. Specifications and dimension tables are included as well as photographic coverage of other products that work in conjunction with the condenser.

Manufacturer—Drayer-Hanson, Inc., 3301 Medford St., Los Angeles 63.

Flat Transmission Belts

Four-page illustrated bulletin describes flat transmission belts and their applications. Listed are recommended uses, specifications, construction data and sizes and lengths.

Manufacturer—Quaker Rubber Corp., Div. of H. K. Porter Co., Inc., Tacony and Comly Sts., Philadelphia 24.

Flexible, Transparent Plastic Tubing

"Ace-Flex," a flexible, transparent plastic tubing is covered in Bulletin 66-D. Physical properties, chemical resistance, standard sizes and general characteristics are included. Suggested applications in food and chemical processing, laboratory, medical and general industrial uses are presented.

Manufacturer—American Hard Rubber Co., 93 Worth St., New York 13.

"Freon" Compressors for Air Conditioning

"Freon" compressors for applications in air conditioning and refrigeration are the subjects of Bulletin No. C-1100-B30C. The bulletin describes the compressors and includes detailed cutaway drawings to show the internal parts. The compressors are also shown incorporated in self contained condenser units utilizing shell and tube water cooled condensers. Included are dimensions and data on all eight models of the "Freon" compressors, eight models of the compressor units and eight models of the condenser units.

Manufacturer—Worthington Corp., Advertising and Sales Promotion Dept., Harrison, N.J.

Heaters for Process Drying

Brochure of engineering case studies describes a variety of applications of warm air space heaters to the job of industrial process drying. Featuring installations for curing rubber and drying ceramic, paper, lumber and woven products, the studies explain the methods followed in applying the heaters to different types of drying systems.

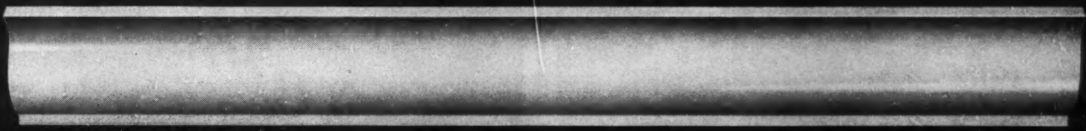
Manufacturer—Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22.

High Current Test Instruments

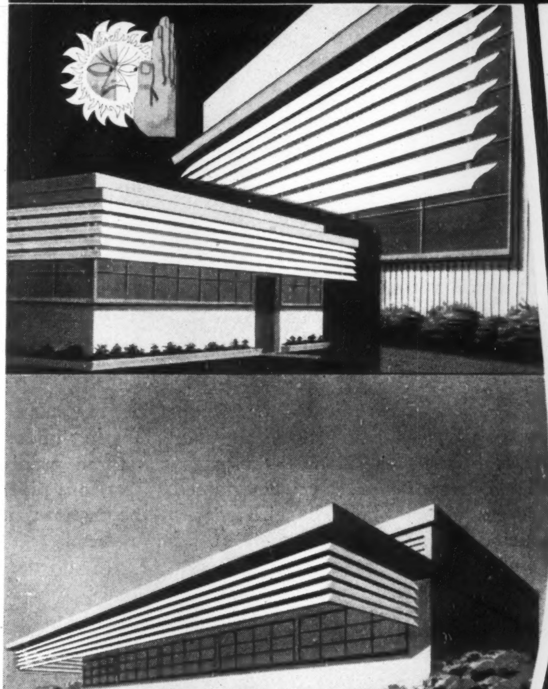
Catalog MA-154 describes a line of portable high current test instruments. Illustrations, di-

make
more money
from air conditioning
with
all-aluminum

K-Louver

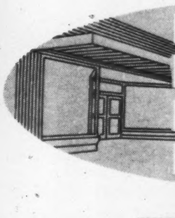


New, Profitable Sun-Control Product by Kawneer



for better air conditioning inside, *Sell* **K-Louvers** *Outside*

Get into this profitable business now. K-Louvers are a natural supplement to air conditioning. They are stationary, "built-in" louvers that take the sun heat-load off windows. That means less work-load on the air conditioning system, and helps keep even temperatures throughout the building. Your customer saves on operating and maintenance costs, and on initial costs in new installations. On-the-job fabrication of K-Louvers is quick and easy and there are no maintenance problems. To learn more about this profitable business and a K-Louver dealership, write today to Kawneer, Niles, Michigan.



Store Fronts
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Doors and Entrances
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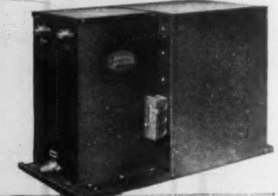
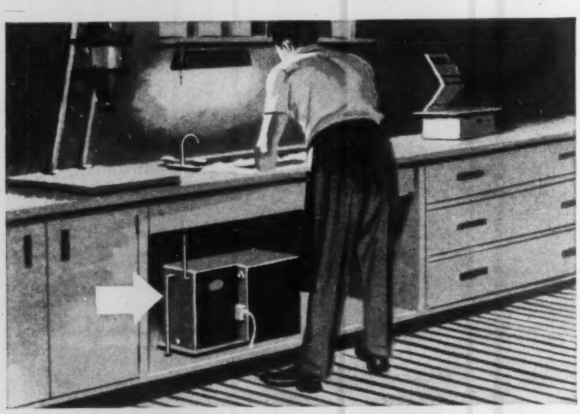
Cool Water

. . . wherever you need it
with the low cost . . .
TEMPRITE
REMOTE WATER COOLER



REDUCE WASTED STEPS and wasted motion! Place Temprite "remote" water coolers in any number of the most convenient locations in your restaurant or cafeteria, *for peak serving efficiency!* Very economical! Quickly and easily installed! *No major overhauling, no costly piping!*



THE VERSATILE TEMPRITE is ideal for many water and other liquid cooling tasks, such as lab experimental work, for photo print developing, etc. *Accurate, easily adjusted temperature!* Compressor, condenser, cooler and wiring enclosed in a metal cabinet. *Approved by Underwriters'.*

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P. O. BOX 72-L, E. MAPLE ROAD
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Originators of Instantaneous Liquid Cooling Devices

RECENT TRADE LITERATURE . . .

[*Continued*]

mensions and a general description of these calibrating and testing instruments are included with a listing of indicated uses and industrial applications. Electrical specifications are also given.

Manufacturer—Multi-Amp Corp., 10 Third St., Newark, N. J.

Hot Water Storage Heater

Catalog No. 18 pictures and describes the company's line of hot water storage heaters and presents information on piping arrangements and installation data. Heaters are cataloged as to weights, dimensions, construction details and capacities, with conversion tables. Listed also are average water requirements of typical hot water fixtures in various types of buildings with examples to show how hot water requirements may be calculated, capacity requirements determined and heaters specified.

Manufacturer—The Patterson-Kelley Co., Inc., 599 Warren St., East Stroudsburg, Pa.

Industrial Cork Products

Bulletin S-54 gives physical characteristics and uses for both natural cork and cork compositions. Government and SAE-ASTM equivalents of the company's cork compositions, as well as sheet sizes and thicknesses, are listed. Bulletin illustrations show typical products made from natural and composition cork.

Manufacturer—Dodge Cork Co., Lancaster 19, Pa.

Industrial Process Control

Bulletin F 5633-1 presents the company's complete line of instruments for industrial process control applications. Discussed are an electronic link for control and recording action, and a combustion safeguard for oil and gas burners.

Manufacturer—Wheelco Instrument Div., Barber-Colman Co., Rockford, Ill.

Insulation for Hot Underground Pipes

Technical Data Manual on "Gilsulate" describes the application of this insulation for hot underground pipes. The manual discusses the three grades available, how ditch sizes are determined for various pipes and types of soil, how the efficiency of the material is calculated and how its performance can be predicted.

Manufacturer—American Gilsonite Co., 134 W. Broadway, Salt Lake City, Utah.

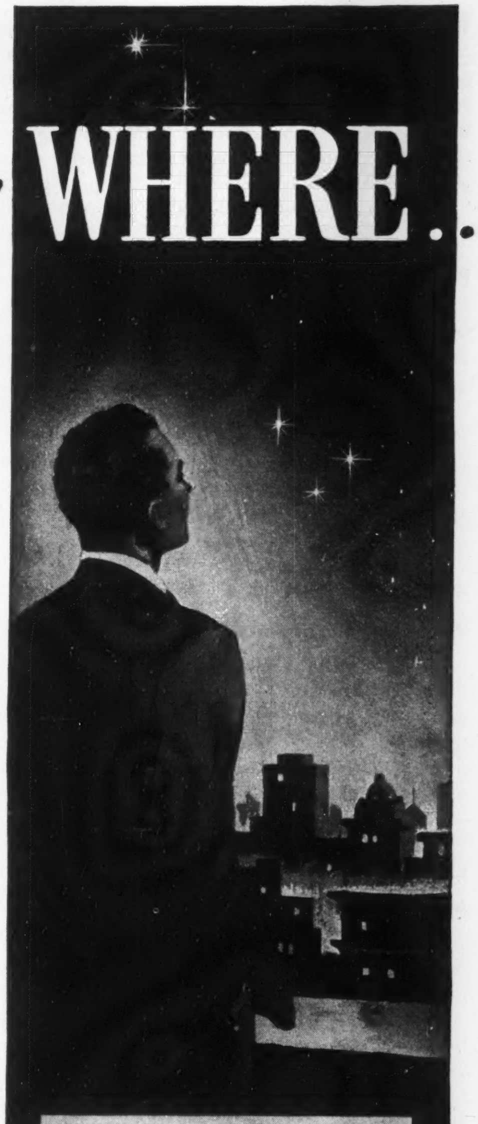
Motor Selection Guide

Selection chart of electrical and mechanical features of standard and special motors is a feature of the company's new catalog on line of 1 to 50 hp a-c motors. The line includes single phase capacitor and the polyphase squirrel cage models.

Manufacturer—Brook Motor Corp., 3555 W. Peterson Ave., Chicago 45, Ill.

Pipe Insulation

"Mono-Kover," a lightweight, one-piece pipe insulation, is the topic of a four-page bulletin. Characteristics described include thermal resistance, permanence, resiliency and non-corrosive properties. Added



Oh! WHERE . . . *is my wandering ad tonight?*

THERE are two ways to buy advertising space. One is the guesswork-opinion method. The caption above is the mournful song of an advertiser who is still selecting media the way it was done before World War I, when there were no standards for the circulations of published media and when there was no accepted and approved method of auditing circulations. In those days, advertisers O.K.'d their proofs and sent out their advertising with a prayer that some of their sales messages would find their way to market.

The other way to buy space is the factual, know-what-you-get-for-your-money method. Today advertisers can start their investments on a basis of facts by selecting media with the help of the information in the reports issued by the AUDIT BUREAU OF CIRCULATIONS. This cooperative and nonprofit association of 3300 advertisers, advertising agencies and publishers, organized in 1914, has established standards that make it possible to evaluate the circulations of published media. The A.B.C. maintains a large staff of experienced and specially trained circulation auditors who make annual audits of the circulations of publisher members. A.B.C. reports give the facts thus obtained.

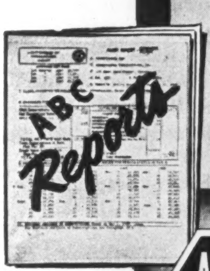
Here are some of the audited facts about business papers that A.B.C. reports tell the advertiser:

—how much paid circulation;
—how much unpaid;
—an occupational or business breakdown of subscribers;
—where they are located;
—how much subscribers pay;
—whether or not premiums are used;
—how many subscribers are in arrears;
—what percentage of subscriptions are renewed.

Those who buy advertising on the basis of this factual information, as given in A.B.C. reports, do not have to speculate about the distribution of their sales messages. They KNOW where and to whom their advertising goes. That is why this business paper is a member of the AUDIT BUREAU OF CIRCULATIONS. Ask for a copy of our A.B.C. report and then study it.

SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

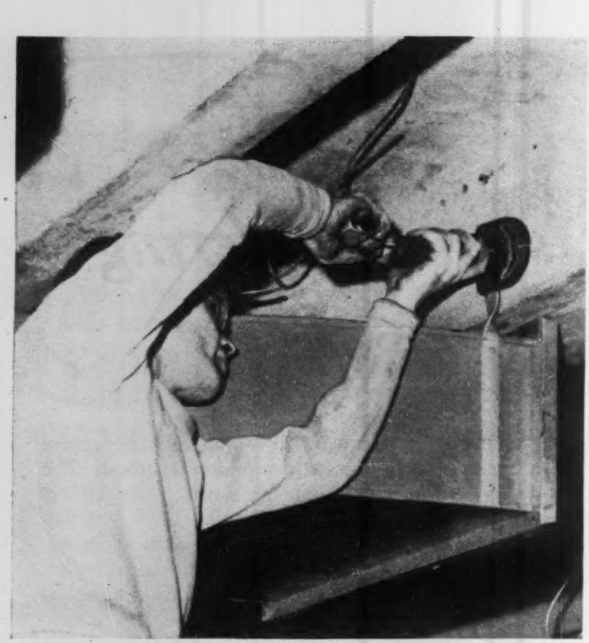
Paid subscriptions and renewals, as defined by A.B.C. standards, indicate an audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.



ABC

HEATING, PIPING &
AIR CONDITIONING

A.B.C. REPORTS—FACTS AS THE BASIC MEASURE OF ADVERTISING VALUE



Ramset SAVES $11,000

for Fastening Air Ducts in Texas' Largest Store

More than two miles of air conditioning ducts were installed with RAMSET SYSTEM in the new addition to Joske's Department Store at San Antonio, Texas, the "largest store in the largest state."

By using RAMSET Jobmaster, anchoring studs were set at the rate of better than 1 per minute, instead of an estimated 15 minutes each by old-fashioned, conventional methods. Substantial cost savings were thus gained, as well as a far faster, completely secure installation. Similar results were obtained for hanging 13 miles of sprinkler piping and anchoring 43 miles of electric conduit.

Ramset Fasteners

The high speed and wide utility of RAMSET SYSTEM have made it the 2-to-1 favorite over all other powder-actuated fastening methods—and more contractors use RAMSET than all other makes combined. Ask your dealer or write us for details on how you can make more profit from every job by using RAMSET SYSTEM.

Ramset Fasteners, INC.

Ramset Division, Olin Industries, Inc.
12109 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING

AN Olin PRODUCT

RECENT TRADE LITERATURE . . .

[*Continued*]

features are a chart indicating thermal efficiency, a suggested specification form, an insulation thickness selection table for insulation surface temperatures and a table showing available sizes, thicknesses and packaging data.

Manufacturer—Baldwin-Hill Co., 500 Breunig Ave., Trenton 2, N.J.

Postweld Heat Treatment

With increased use of the austenitic steels, particularly for piping and pressure vessel fabrication, confusion and misunderstanding has occurred regarding the need for stress relief and the effects of such heat treatment on the performance of weldments in service. *The Recommended Practices for Postweld Heat Treatment of Austenitic Weldments* summarizes the considerations necessary to determine whether, for a given application, stress relief should be used, and if so, at what time and temperature.

Published by—The American Welding Society, 33 W. 39th St., New York 18. It is priced at 50 cents a copy.

Pressure Gage Guide

"Ashcroft" gage catalog presents detailed information on pressure gages, gage accessories and gage engineering information. Supplemented by numerous photographs, line drawings and dimensional drawings, the new catalog is sectionalized by product lines and contains a numerical index, alphabetical index and selector tables.

Manufacturer—Manning, Maxwell & Moore, Inc., 250 E. Main St., Stratford, Conn.

Process Control Instruments

Catalog 2 lists a variety of flow meters, recorders, controllers, pressure regulators, sight flow indicators and chemical feeders. Price lists and instrument specifications are included. Sizing nomographs for the two most common types of "Flowrator" meters are also given covering both liquid and gas service.

Manufacturer—Fischer & Porter Co., 924 Jacksonville Rd., Hatboro, Pa.

Pulpit Air Conditioner

Bulletin No. 1307 describes a pulpit air conditioner designed and developed for use in industrial control areas where heat, dirt or fumes create hazardous working conditions. The four-page booklet lists all mechanical features of the conditioners and presents tables of capacities and dimensions of the different evaporator and condenser sections available.

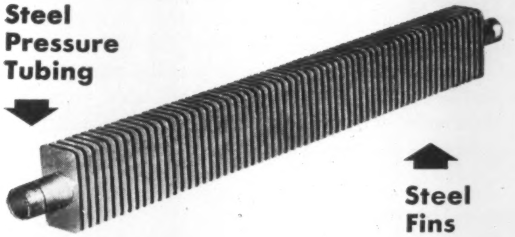
Manufacturer—Dravo Corp., 1203 Dravo Bldg., Pittsburgh 22.

Reciprocating Plunger Pumps

Bulletin No. P-1153 describes simplex and duplex reciprocating plunger pumps for pressures up to 20,000 lb and capacities up to 900 gph. Included in this bulletin is information on the standard stainless steel, spring loaded double ball check valve as well as the "Saf-T-Kleen" valve. Structural features are illustrated.

Manufacturer—Philadelphia Pump and Machinery Co., Wynnewood, Pa.

STEEL TO STEEL KEEPS FINS TIGHT



Maximum efficiency in finned radiation requires perfect, continuous contact between fins and pipe at all times for only when this contact is perfect will there be maximum heat transfer from pipe to fins and from fins to room air.

AUTORAD uses steel for *both* tube and fins and since the coefficient of expansion of fins and tubing is the same, no amount of expansion or contraction can lessen the bond between them and decrease heat transfer. And no electrolytic action can destroy the perfect bond.

AUTORAD has developed a method of bonding fins to tubing so that the resulting contact is as firm and perfect as a welded joint. As a consequence heat transfer is kept at peak efficiency.

To you as a contractor this means long years of customer satisfaction and customer satisfaction means greater profits to you.

Ask for complete data and prices.

AUTO-RAD Inc.

3535 Fillmore Street, Chicago 24, Illinois

Where the best in air conditioning is required . . . specify . . . *Ice-Cels*

CENTRAL PRESBYTERIAN CHURCH
JACKSON, MISSISSIPPI

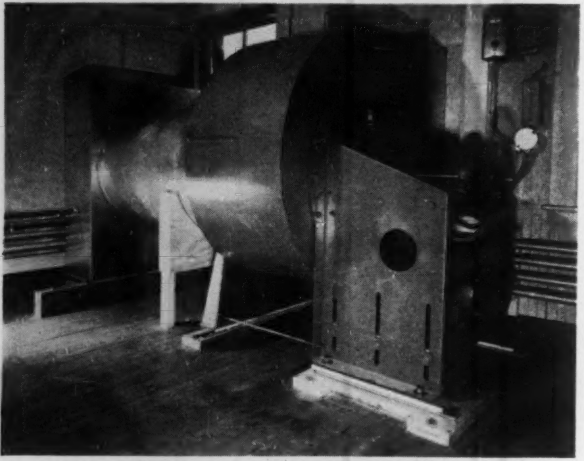
APPLICATION: Two DOLE *ICE-CEL* units, with a combined capacity of 192 ton hours, are hooked up with one 15 H.P. compressor.
LOAD: 75 tons an hour for two hours, or 150 ton hours — 40 ton hours in excess of actual requirements.
DOLE *ICE-CEL* units are available for low cost installation in churches, halls, mortuaries, offices, retail stores and cafeterias. . . WRITE FOR ENGINEERING CATALOG BE

DOLE COLD PLATES

DOLE REFRIGERATING COMPANY
5918 N. Pulaski Road, Chicago 30, Ill.
103 Park Avenue, New York 17, N.Y.
In Canada: Dole Refrigerating Products, Ltd.
44 Elgin Street, Brantford, Ont.

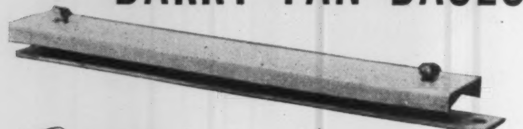
Maximum Refrigeration Efficiency
DOLE®
MANUFACTURERS OF
THE *Cel* LINE

THIS FAN *had* TO BE SILENT



so they *isolated* it on

BARRY FAN BASES



Carter's — the famous makers of fine underwear for the entire family — had to install this large ventilating blower on a mill-construction floor, directly above executive offices. From previous experience with similar installations, the plant superintendent expected plenty of complaints about vibration and noise.

The installation was made, using the new Barry custom-built vibration isolating bases — and there have been *no* complaints of any sort. At all operating speeds, the vibration of the heavy motor and fan is thoroughly isolated from the supporting floor. Even though the flooring is of relatively light mill construction, it gets no chance to act as a sounding board.

Barry fan bases are the ideal choice for the toughest jobs of isolating vibration and noise caused by any type of heating and ventilating or air-conditioning equipment. Each base is a *custom* job, specifically designed for the equipment it will carry. That is why these bases can be backed by a money-back guarantee. That is also why Carter's — with a tricky installation problem solved — is another satisfied user of Barry fan bases.

If transmitted noise and vibration is YOUR problem, we can help you. Write TODAY for your free copy of Bulletin 539.

Barry
Quality

THE BARRY CORP.
782 Pleasant Street,
Watertown 72, Mass.
Sales Representatives in Principal Cities

RECENT TRADE LITERATURE . . .

[*Continued*]

Refrigeration Coils and Pans

Bulletin covers the manufacturer's line of junior size coils and drip pans, "Tenneyaire Jr." The equipment is used for dairy boxes, display cases, etc. A full page is devoted to drawings and tables giving dimensions of pans available for use with 30 different coil models. Data includes pan widths and lengths, hanger dimensions and number of louvers. One table gives Btu per hr, number of tubes per coil, and over-all dimensions.

Manufacturer—Tenney Engineering, Inc., 26 Ave. B, Newark 5, N.J.

Resistance Thermometer Bulbs

Catalog 5701 describes resistance thermometer bulbs of high speed, marine, room temperature and sanitary types, for temperature spans as narrow as 20 F. Also included are wet and dry bulb resistance thermometer assemblies for measurement of relative humidity.

Manufacturer—Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne and Windrim Aves., Station 64, Philadelphia 44.

Stainless Steel in the Paper Industry

A new booklet describing the uses of stainless steel in the paper industry has recently been published. It includes descriptions indicating where stainless steel is used in the pulp and paper industries plus detailed information on the technology of the company's metal. A special stainless finder for use in the paper industry analyzes the types of stainless available on the basis of comparative properties.

Manufacturer—Allegheny Ludlum Steel Corp., 2020 Oliver Bldg., Pittsburgh 22.

Thermostatic Bimetals

New 36-page illustrated booklet describes and explains 22 uses of bimetal as actuating elements in temperature responsive devices manufactured by customers of the company. Included are 10 pages of engineering data for element design and selection.

Manufacturer—W. M. Chace Co., 1657 Beard Ave., Detroit 9.

Vibration Isolators

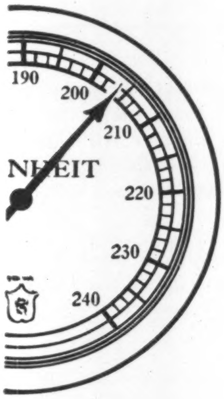
Product Bulletin 537 presents detailed technical and application information on the "Series 262" and "Series 633" vibration isolators. Included are data on dimensions and load ratings, installation procedure, variation of natural frequency with load, and percent efficiency of isolation.

Manufacturer—The Barry Corp., 882 Pleasant St., Watertown 72, Mass.

Water Gage Television

Bulletin WG-1813 describes equipment for television boiler water level gages. The equipment includes television cameras, illuminator, monitor and all necessary linkage. Auxiliary viewing monitors are also shown.

Manufacturer—Yarnall-Waring Co., 107 Mermaid Ave., Philadelphia 18.


190
200
210
NHEIT
220
230
240

if high fuel oil temperatures are what you need—the

Paracoil TYPE "GF"*

INDIRECT GAS FIRED FUEL OIL HEATER

is the answer!

With sub-water-line oil heaters, a low circulating boiler water temperature can play havoc with even the best engineered No. 6 oil burner layouts—particularly with the viscous oils now being used!

Our Type "GF" Indirect Gas Fired Heater can give you any desired oil temperature you want—without the use of expensive electric boosters!

APPLICABLE TO ALL TYPES OF OIL FIRED APPARATUS!

As it is not dependent upon the unit it is servicing for the means of heating the oil, the Type "GF" Heater can be applied to any oil fired apparatus, be it a steam or hot water boiler, a process oven, a dryer or a kiln!

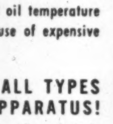
ONE HEATER CAN SERVE MANY BURNERS!

No steam piping required. Heater operates on a closed, internal steam and condensate cycle!

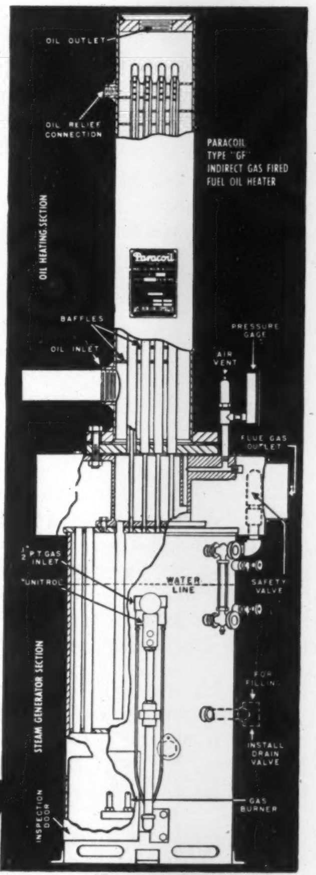
CHECK THESE FEATURES!

Completely factory assembled • Easy to install anywhere, even outdoors • Requires only minimum of floor space • Economical to operate • Wide range of oil heating capacities • Burns any specified type of gas fuel • High oil temperatures at all times • Operation unaffected by normal variation in viscosities of oils being heated.

***Write today* for BULLETIN 60-L**



Approved by
Board of Standards
and Appeals City of New York


OIL OUTLET
OIL RELIEF CONNECTION
PARACOIL TYPE "GF" INDIRECT GAS FIRED FUEL OIL HEATER
OIL HEATING SECTION
Paracoil
BAFFLES
OIL INLET
PRESSURE GAGE
AIR VENT
FLUE GAS OUTLET
½" P.T. GAS INLET
"UNITROL"
WATER LINE
SAFETY VALVE
STEAM GENERATOR SECTION
FOR FILLING
INSTALL DRAIN VALVE
INSPECTION DOOR
GAS BURNER

*Patents Pending

DAVIS ENGINEERING

CORPORATION

1064 EAST GRAND ST., ELIZABETH 4, N. J. • 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

They SELL! They PLEASE! AURORA CLOSE-COUPLED *Packaged*

AIR CONDITIONING PUMPS

for EVAPORATOR COOLING TOWERS
•
AIR CONDITIONING UNITS
•
***also for* GENERAL SERVICE**

These are outstanding pumps, high in favor with air conditioning contractors and manufacturers of air conditioning equipment. Mechanical seal requires no packing or maintenance. Disassembly without disturbing pipe connections or hold down bolts.

- LOW COST
- SMOOTH, QUIET
- DEPENDABLE
- LONG LIVED
- MECHANICAL SEAL
- DISASSEMBLY is QUICK, SIMPLE
- CARRIED IN STOCK

AURORA
PUMP CO

Capacities up to 150 G. P. M., Heads to 100 Ft.

Aurora Type JMC Pump—Close-Coupled

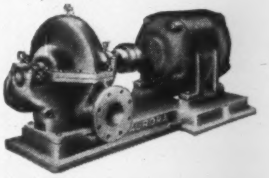
CASINGS vertically split. Casing wearing ring standard.

MECHANICAL SEAL—standard, located in packing cover.

IMPELLER—balanced, enclosed type, high grade bronze.

MOTOR—NEMA specs., stainless steel shaft on JMC—for all circuits and various enclosures.

BALL BEARINGS—on JMC, built into motor.



OTHER AURORA AIR CONDITIONING UNITS

We are also in a position to supply various sizes of air conditioning pumps in V-Belt drive, and flexible coupling drive. Our large size type G.M.C. Close-Coupled Pumps can be furnished up to 800 G. P. M. and heads to 200 ft.

ALSO—AURORA SPLIT CASE CENTRIFUGAL PUMPS

—single and two stage for water supply, handling condenser circulating water, brine circulation, booster service and many other duties.

Complete Information on Request

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA *Always* PUMPS

AURORA PUMP COMPANY

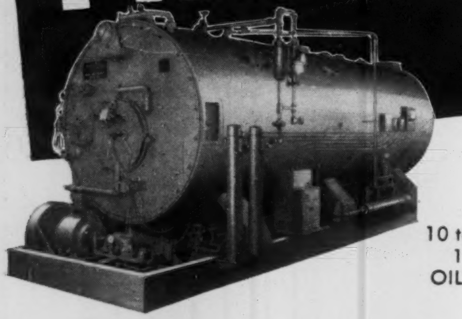
Division of the New York Air Brake Company

80 Loucks Street
Aurora, Illinois

REAL SAVINGS

in installation . . . in operation
with these "PACKAGED" BOILERS

AMESTEAM
GENERATOR



20 SIZES
10 to 600 h.p.
15 to 200#
OIL OR GAS

JUST SET IT ON YOUR CONCRETE FLOOR — no special foundation or heavy stack are needed. You make BIG savings on installation of AMESTEAM GENERATOR because it's a complete, self-contained unit, ready to start generating steam!

FULLY AUTOMATIC . . . TROUBLE-FREE! Set it and forget it. No more continual dirt, dust and ashes. Models for oil or for gas, or combination units for either fuel.

EASY TO CLEAN! EASY TO GET AT! Davit-hinged doors at rear give quick access to furnace and all tubes — and look at the space under the shell!

COMPLETE SERVICE! Our LOCAL service man starts your unit and gives you three months' FREE service.

Write for FREE bulletin TODAY!

AMES IRON WORKS
Box D-34, Oswego, N.Y.
Gentlemen:
Please send me further information on AMESTEAM GENERATORS and name of nearest representative.

NAME..
COMPANY..
ADDRESS..

AMES IRON WORKS INC.

BOX D-34 OSWEGO, N. Y.

WHO'S WHAT . . .

JOHN A. GILBREATH, former assistant vice president of Servel, Inc., has been named division manager of the *WESTINGHOUSE ELECTRIC CORP.'s* new Air Conditioning Div. Headquarters of the new division, formerly a part of the Sturtevant Div., will be at Staunton, Va.

C. D. BARCLAY, who retired recently as head of the Utility Div. of Ralston Purina Co., has joined the *ECONOMY EQUIPMENT CO.* as a sales engineer.

THOMAS DAVENPORT has been appointed chief sales engineer of the Air Conditioning Div. of *PACIFIC SCIENTIFIC CO.* He will be stationed in San Francisco and will direct air conditioning activities at all four Pacific coast offices.

EATON MFG. CO. has announced that *F. H. MOTT* will become administrative vice president in charge of all plant operations in Michigan, and *R. E. FISHER* will be vice president in charge of sales for the corporation. *R. H. DAISLEY*, formerly vice president-manufacturing, becomes administrative vice president in charge of all plants in Ohio, Kenosha, Wis., and London, Ont.

The *FORT WORTH AIR CONDITIONING ASSOC.* has reported the election of officers for 1954 as follows: president, *W. I. SPITLER* of Air Accessories, Inc.; first vice president, *B. P. RHINEFORT*, B. P. Rhinefort Co.; second vice president, *H. E. CUNNINGHAM*, Lydick-Barmann Co.; and secretary-treasurer, *M. B. MOBLEY* of Texas Electric Service Co.

W. K. SMITH has been appointed field sales manager of the *UNION ASBESTOS and RUBBER CO.'s* heating division. He had been district manager of the Fedders-Quigan heating division.

ROBERT H. GROMAN, divisional sales manager for *EUTECTIC WELDING ALLOYS CORP.*, has been promoted to the position of director of applied welding engineering. He has been with the corporation for more than nine years.

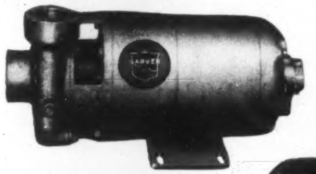
FRED F. ROEHLL, national sales manager of Eutectic, has been named vice president in charge of sales.

The appointment of *C. R. SMITH* as director of industrial relations and personnel for the Morton Grove, Ill., Ridgewood, N.J., and DeQueen, Ark. plants, has been announced by *BELL & GOSSETT CO.*

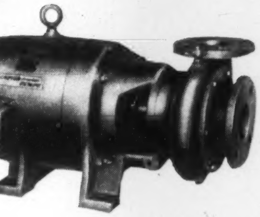
H. R. NIELSEN has been named manager of the air conditioning division at *SERVEL, INC.* Mr. Nielsen has been sales manager of the division.

A new member of the engineering staff of the *COOPER ALLOY FOUNDRY CO.* is *GLENN J. GIBSON*. He will

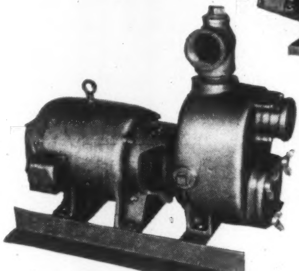
Got a *Pumping* problem? Let CARVER Help You Get Top Performance!



MODEL B ELECTROPUMP
5 to 70 G.P.M.



TYPE L ELECTROPUMP
30 to 900 G.P.M.



MODEL "K" PUMPS
Self-Priming
20 to 4000 G.P.M.

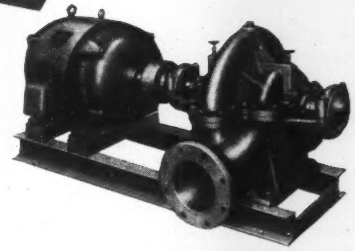


Fig. "400"
SPLIT-CASE PUMPS
200 to 2000 G.P.M.

Whatever your requirements there is a pumping unit in CARVER'S Complete Line that will fit your needs to a "T". On the easy jobs or the tough ones, the outstanding performance, inherent high efficiency and improved hydraulic design of CARVER PUMPS give you thoroughly dependable operation with full pumping economy . . . your best buy for better pumping. A few of them are illustrated.

Ask CARVER for the answer to your pumping problems . . . today. Give us the conditions, we'll give you the answer.

CARVER PUMPS are available with motor, gasoline engine, diesel or belt drive.

CARVER *The Quality Name in Pumps*

CARVER PUMP COMPANY
1460 Hershey Ave., Muscatine, Iowa

CARVER
the quality name in pumps

Residential AIR CONDITIONING *Without Water!*

UNICON

by KRAMER

A Remote Type Air-Cooled Condenser that completely eliminates water, sewerage and plumbing problems.

SPECIFICALLY DESIGNED FOR RESIDENTIAL APPLICATION

Unusually Quiet!

WRITE FOR BULLETIN No. U 250

KRAMER TRENTON CO.
Trenton 5, N.J.

NOW 3 PLUS FEATURES

NEW MOVABLE 'S' HOOKS cut installation costs

NEW SLOPING COVER for improved appearance

NEW ADDITIONAL SIZES to suit every job

BROWN
BAYCE Heavy Duty HEET

Where other makes require from 2 to 5 bolts BROWN Heavy-Duty BAYCE-HEET needs only 1 bolt
I=B=R
Reg. U.S. Pat. Off.

Contractors acclaim BROWN Heavy-Duty BAYCE-HEET "Easiest, Most Economical to Install." New movable 'S' hooks eliminate as many as four lag bolts. Most contractors figure $1.00 installation cost per lag bolt . . . save a lag bolt and you save a dollar. If the fintube you now use requires 4 lag bolts, you save $3.00 by switching to BROWN Heavy-Duty BAYCE-HEET.

Records of every-day jobs show installation savings averaging 10% with BROWN Heavy-Duty BAYCE-HEET.

Write for Bulletin 300-1

BROWN PRODUCTS COMPANY
FOREST HILLS, NEW YORK

WHO'S WHAT . . .

[*Continued*]

direct a research program aimed at developing superior methods for the welding of corrosion and heat resistant alloys.

S. H. SMITH, district manager of *AIR REDUCTION SALES CO.*'s Milwaukee office, retired recently under the company's mandatory retirement plan. *G. J. DEKKER*, formerly district manager at St. Louis, succeeds Mr. Smith in Milwaukee.

ROBERT N. SHELEY, who has had 20 years of service as an architect and engineer for *OWENS-ILLINOIS GLASS CO.*, has been promoted to chief architectural engineer. He succeeds Walter V. Wuellner, who is resigning to establish his own architectural firm.

WORTHINGTON CORP. has announced the appointments of *JOHN E. LANCASTER* as chief engineer, heavy machinery section, and *ROLAND G. EWER* as consulting engineer, Air Conditioning and Refrigeration Div.

MORGAN GREENWOOD has been promoted to the position of general advertising manager of *PHILCO CORP.* Since 1948 he has been advertising manager of the Television and Radio Div.

PROF. ROBERT S. GREEN, chairman of the department of welding engineering at *OHIO STATE UNIVERSITY*, has been named executive director of the university's Engineering Experiment Station. He succeeds Prof. Jacob R. Shank, who will devote his full time to his professorship in the department of civil engineering.

HENRY E. ROSSELL, JR. has been appointed manager of dealer development of the Sunbeam Air Conditioner Div. of *AMERICAN RADIATOR & STANDARD SANITARY CORP.*
W. WALTON WOODROOF has been appointed manager of cooling sales of the Sunbeam division. He will supervise all field sales from his headquarters in Pittsburgh.

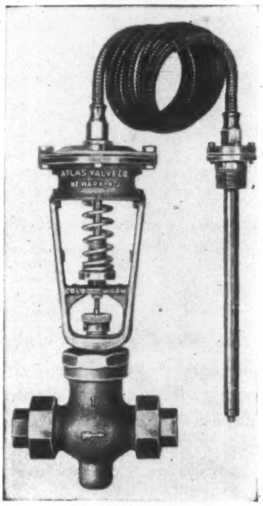
WILLIAM R. HOUGH, engineering vice president of *RELIANCE ELECTRIC & ENGINEERING CO.*, was elected a director of the company at the recent annual meeting of shareholders.

ROBERT L. LARSON has been named manager of the alloy steel division of *JOSEPH T. RYERSON & SON, INC.* He was formerly manager of alloy steel sales, Chicago plant. Succeeding him in that position is *WILLIAM P. LOEHRER*.

WILLIAM DOWD is now associated with the *CARVER PUMP CO.* as a consultant in redesigning and developing

ATLAS

TEMPERATURE REGULATORS are made for EVERY SERVICE



Your temperature regulating problems, no matter how tough, can be handled by ATLAS Engineers. You can place your problems in their hands with confidence because the making of regulating valves has been our ONLY business for more than a half century.

For example, every American is proud of the achievements of the new ocean liner—the

S.S. UNITED STATES

On page 144 of the Sept. 1952 issue of MARINE ENGINEERING & SHIPPING REVIEW you will find that ATLAS is credited with furnishing: "Valves, regulators and strainers (composition reducing valves, composition pressure reducing valves, combined pressure and temperature regulators, composition strainers)"—all on the S.S. United States.

Where Are They Used?

ATLAS Temperature Regulators are used to control the temperature of water, fuel oil, and other liquids in all kinds of open and closed tanks and heaters which are heated by steam or gas. Those listed below are completely described in our Bulletins No. 6-A and 7-A. Ask for a copy of each.

No. 650. Balanced Type Double Seat Valve, Spring Adjustment. Sizes ½" to 6" inclusive.
Nos. 651 and 653. Needle Type Single Seat Valve. Spring Adjustment. Sizes ½" to 1½" inclusive.
No. 655. Balanced Type Double Seat Valve, Lever and Weight Adjustment. Sizes ½" to 6" inclusive.
Nos. 660 and 662. Single Seat, Self-Contained, Pilot Operated for High Pressure Steam. Sizes ½" to 4" inclusive.
Nos. 112-651 and 112-653. Combination Temperature and Pressure Regulator. Sizes ½" to 4" inclusive.
No. 651-ES Combination Temperature and Pressure Regulator. Sizes ½" to 2" inclusive.
No. 6 Thermostat, Pneumatically Operated.
No. 12 Thermostat, Hydraulically Operated.

Ask for literature on those in which you are interested.

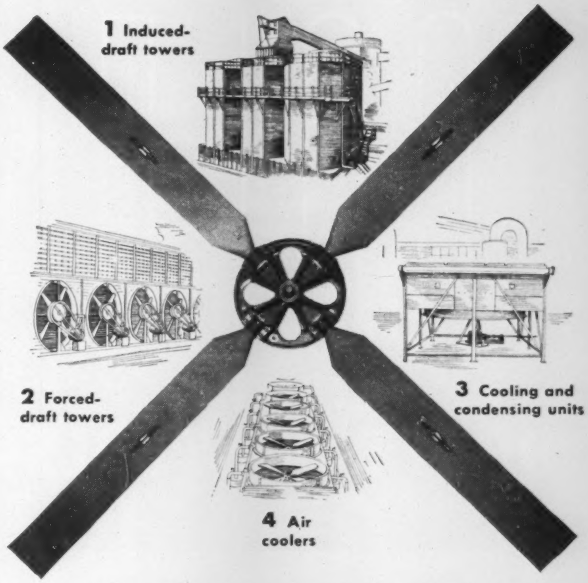
See list of the principal ATLAS products below.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE

276 South Street **Newark 5, New Jersey**

Represented in Principal Cities

Campbell Boiler Feed Regulator
Temperature Regulators
Reducing Valves
Exhaust Control System
Pressure Regulators
Pump Governors
Damper Regulators
Back Pressure Valves
Balanced Valves
Control Valves
Float Valves
Oil Control Cocks



AEROMASTER FANS

First choice for all four

Ask the manufacturer . . . *ask the user* . . . what fan he prefers for his cooling equipment. Chances are he'll say Aeromaster.

Why? Because he knows from experience that Aeromaster Fans can be relied upon to give good service.

Aeromaster Fans are *precision-engineered,* adapted from high speed aircraft propellers. They have adjustable blade pitch and anti-flutter design . . . therefore, require less horsepower. And they last longer too, thanks to the exclusive Aeroloid blade coating to resist acids and alkalies, abrasion and weather. Overall result: Aeromaster Fans *give more cooling at lower cost.*

Available in 4, 6, or 8 blade styles, in diameters of 5 to 24 ft., with capacities up to 1,000,000 cubic feet per minute, all Aeromaster Fans are fully guaranteed.

Koppers also has trained engineering specialists available in principal cities, insuring prompt, expert Aeromaster Fan service. And Koppers is always ready to consult with you on special fan problems. Next time you plan a replacement of present fans, specify Aeromaster. And when you consider new equipment, call on Koppers . . . always eager to be of service.

KOPPERS ®

Aeromaster Fans

METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. BALTIMORE, MD. This Koppers Division also supplies industry with Fast's Couplings, American Hammered Industrial Piston and Sealing Rings, Koppers Electrostatic Precipitators and Gas Apparatus.
Engineered Products Sold with Service

MAIL COUPON TODAY FOR COMPLETE INFORMATION

KOPPERS COMPANY, INC., *Aeromaster Fans*
243 Scott St., Baltimore 3, Md.

Gentlemen: Please send me detailed information on Aeromaster Fans for ....(name and type of equipment to be cooled).

Name..
Title..........................Company..........................
Address..
City..........................Zone......State..........................

COLE

INDUSTRIAL

DRAFT CONTROLS

FOR EVERY NEED — ANY SIZE — ANY SHAPE

Outperform and outlast

ORDINARY CONTROLS

COLE

Standard Round Damper Control

Saves 10% to 30% on fuel. Internal damper type. Ball bearing equipped, counterbalanced in all positions. Large close fitting blades. Top or side mounting. Stock sizes 6" to 36". Special sizes on order.

COLE

Standard Square Gate Control

Open check type. Perfectly counterbalanced. Ball bearing equipped. Stock sizes from 14" to 36". Can be mounted on either side or top of breeching. Special sizes on order.

Exclusive Territories Available for Sales Engineers

COLE-SEWELL ENGINEERING CO.

2288 UNIVERSITY AVENUE • ST. PAUL 14, MINNESOTA

WHO'S WHAT . . .

[Continued]

certain lines of the company's centrifugal pumps. Until 1945 he was chief engineer and vice president of the Dayton-Dowd Co.

A. M. LOWREY is the new assistant general sales manager, western division branches, *QUAKER RUBBER CORP.*, Div. of *H. K. PORTER CO., INC.*

ANSUL CHEMICAL CO. has announced the appointment of *RICHARD M. BAKER* as advertising and sales promotion manager. Mr. Baker has been with the company six years as publicity manager.

JOHN A. FAAS has been appointed chief mechanical engineer of *WALTER KIDDE CONSTRUCTORS, INC.* Mr. Faas is a specialist in the design and construction of chemical processing plants.

JACK W. WATSON has been appointed director of public relations and advertising by *KAISER ALUMINUM & CHEMICAL CORP.* Mr. Watson has been associated with the organization since 1946 when it first entered the aluminum field.

At the annual meeting of the *MIDWEST STOKER ASSOC.*, an organization of Chicago stoker distributors and factory branches, the following officers were elected: president, *JOHN J. HAYES*, manager of Auburn Stoker Co.; vice president (re-elected) *E. M. MAY*, branch manager, The Steel Products Engineering Co.; secretary-treasurer (re-elected), *F. H. HERNDON*, president of Herndon Sales & Service Co.

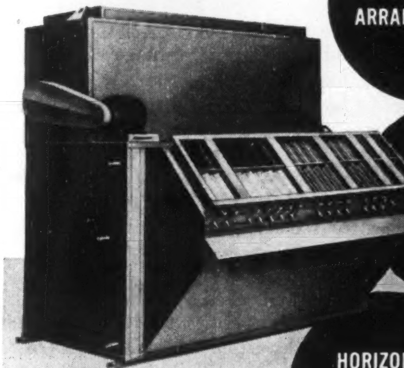
The board of directors of *RHEEM MFG. CO.* has announced the appointment of *C. V. COONS*, a vice president and member of the board, as resident director in New York, and of *WILLIAM S. RHEEM II* as general manager. Mr. Coons and Mr. Rheem were formerly general manager and assistant general manager, respectively. Both will continue to maintain their present headquarters, Mr. Coons in New York and Mr. Rheem in Los Angeles.

PHILIP B. HOPPIN has been appointed manager of advertising and sales promotion for the Air Conditioning Div. of *GENERAL ELECTRIC CO.*

JAMES H. SHAW has been named director of laboratory facilities for *CARRIER CORP.* Prior to this appointment he was with Eastman Kodak Co. Several articles by him have been published in HPAC.

T. C. HADDEN, JR. has joined *WARD LEONARD ELECTRIC CO.* as purchasing agent. Mr. Hadden was formerly associated with the Western Electric Co., Inc.

Only the d-h Flexazone Central-Plant Air Conditioner Gives you



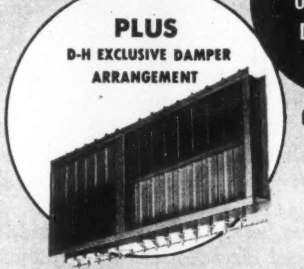
24 ARRANGEMENTS!

ZONES EASILY FIELD ALTERED!

HORIZONTAL OR VERTICAL DISCHARGE!

PLUS

D-H EXCLUSIVE DAMPER ARRANGEMENT



Gives independent, variable control for as many as 7 separate zones

Flexibility—that's the *extra* you get with Flexazone! Only Flexazone can be assembled 24 different ways, depending upon available space—*in the field*. Only Flexazone allows you to add or change zones at any time—*in the field*. And only Flexazone gives you a choice of horizontal or angular air flow from the plenum. These *exclusive* features pay off in cheaper installation, greater design-freedom and lower costs—important benefits, whether you're a contractor, architect, engineer, or building owner!

Want to learn more about Flexazone? Write for bulletin C-4.22.

drayer-hanson
INCORPORATED
3301 MEDFORD STREET, LOS ANGELES 63, CALIFORNIA

Announcing DRAVO'S COMPLETE LINE OF HEATERS

THE DRAVO *Counterflo...*
40 Models
400,000 to 2,000,000 Btu/hr output
For large commercial and industrial buildings

THE DRAVO *Paraflo...*
4 Models
200,000 to 250,000 Btu/hr output
For smaller industrial or commercial buildings

THE DRAVO *Gas Fired* UNIT HEATER...
68,000 to 172,000 Btu/hr output
10 Models
For stores, service stations and other small buildings

ALL DRAVO HEATERS have automatic temperature control and a minimum efficiency of 80%... require no ductwork... are ideal for heating in the winter, ventilation in the summer and for process drying.

DRAVO
CORPORATION
Sales Representatives in Principal Cities

Send the coupon for complete information

DRAVO CORPORATION, Heating Department
Fifth and Liberty Avenues, Pittsburgh 22, Penna.

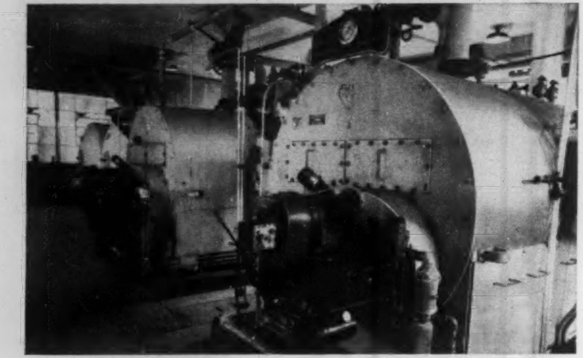
Please send me complete information about the Dravo:

☐ **Counterflo Space Heater** ☐ **Paraflo Space Heater**
☐ **Gas Fired Unit Heater**

☐ Please have a representative call at no obligation to me.
Ask for Bulletin EF 598-4657.

Name__________ Title__________
Company__________
Address__________
City__________ Zone_____ State_____

How 2 Dutton EconoTHERMS
CAN CUT YEARLY STEAM COSTS



OFF-CENTER FIRING • ROTARY COMBUSTION
GAS OR OIL FIRED • AUTOMATIC OPERATION
NO COSTLY CHIMNEY OR FOUNDATION
ONE "PACKAGE"—FACTORY PRE-TESTED

DO YOUR DAILY and seasonal steam loads vary widely? Many owners find that *two or more* Dutton EconoTherm Boilers give big advantages over a single larger unit — especially in *lower total steam costs!*

WITH TWO OR MORE EconoTherms, you can meet varying steam demands fast — and at *peak fuel efficiency.* Yet you save fuel each day and all year by operating just *one* unit during warmer weather, "off hours", nights, week-ends and holidays.

MULTIPLE UNITS give *extra* protection from plant shutdowns . . . and as your plant grows, it's easy to add another "packaged" EconoTherm. Because steam costs depend mostly on fuel and labor costs, *every EconoTherm feature* is designed to keep costs low!

CALL YOUR DUTTON REPRESENTATIVE — he'll carefully analyze your particular needs and offer cost-cutting suggestions.

CHECK FIRST with
WRITE FOR DUTTON ECONOTHERM BULLETIN EC-52G

Dutton BOILERS
Division Hapman-Dutton Company
KALAMAZOO, MICHIGAN
Boiler Builders Since 1880
Four Types — Sizes from 5 to 300 H.P.

WHO'S WHAT . . .

[Continued]

As part of the reorganization of the *SOUTH WIND DIV.* of *STEWART-WARNER CORP., D. A. POTTER,* formerly chief engineer at South Wind, has been named to the newly created position of manager of aircraft and military products. *F. A. RYDER,* who previously served as director of research, has been appointed manager of automotive and home heating equipment. *L. E. BASS,* former assistant to the plant manager, has been promoted to the new position of manager of contract manufacturing and special devices.

BUSH MFG. CO. has announced the appointment of *GEORGE SINICHKO* as chief application engineer for the air conditioning and commercial refrigeration divisions. Since 1951 he has served as a sales engineer for Bush and the Heat-X-Changer Co. in the Pittsburgh area.

LEONARD C. KROES now is sales manager of the *BRUNDAGE CO.* Since 1946 he has been regional sales manager in Michigan for the Kalamazoo Stove & Furnace Co.

HARRY W. BURKE has been appointed field service engineer with the service department of *CORY CORP.* In his new capacity, Mr. Burke will serve as a special assistant to *GEORGE SEDLACK,* chief service manager.

M. NIELSEN, vice president of the *BABCOCK & WILCOX, CO.,* has been elected a member of the board of directors and placed in charge of the company's Boiler Div. He has been with the firm since 1924. The appointment fills a vacancy created by the death of J. H. King.

W. D. SULLIVAN has been elected a vice president of the company and has been placed in charge of the manufacturing department of the Boiler Div., succeeding Mr. Nielsen.

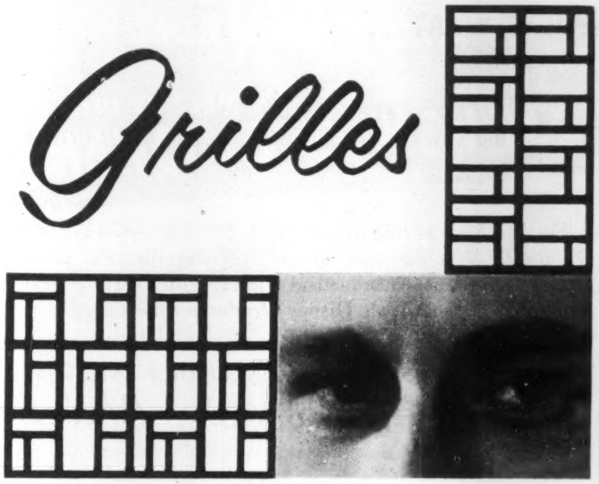
H. C. MUELLER, president of *POWERS REGULATOR CO.* in Skokie, Ill., has been elected president of the Skokie Valley Industrial Association.

R. E. MOORE and *CLARENCE E. PULLUM* have been elected executive vice presidents of *BELL & GOSSETT CO. E. J. GOSSETT,* president of the company, has also been named chairman of the board. Mr. Moore has been vice president and secretary and Mr. Pullum has been vice president and treasurer.

IN THE TERRITORIES . . .

For *DETROIT STOKER CO.*—Sales representation in the Pittsburgh territory has been transferred to the *CRAIG EQUIPMENT CO.,* 1526 Farmers Bank Bldg., Pittsburgh 22.

Grilles



for that

distinctive look

Just as eye-appealing as they are functional, Hendrick Perforated Metal Grilles will greatly enhance the beauty of your decorative motif.

They provide more-than-ample open area for the free passage of air, and are available in a wide variety of designs to best set off your decor. And they're easy to install — always lie flat because of a special flattening operation in their manufacture.

Over one hundred basic designs are available to choose from — many are obtainable only from Hendrick. Hendrick will gladly cooperate with architects to help select from a wide range of standard and special designs. For more complete details write Hendrick today!

SEE OUR CATALOG IN SWEET'S

Hendrick
MANUFACTURING COMPANY

48 DUNDAFF ST., CARBONDALE, PA. • *Sales Offices in Principal Cities*
Perforated Metal • Perforated Metal Screens • Wedge-Slot Screens • Architectural Grilles • Mitco Open Steel Flooring • Shur-Site Treads • Armorgrids

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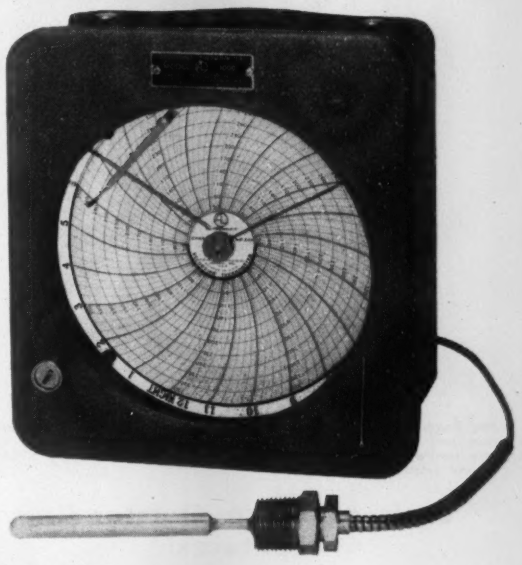
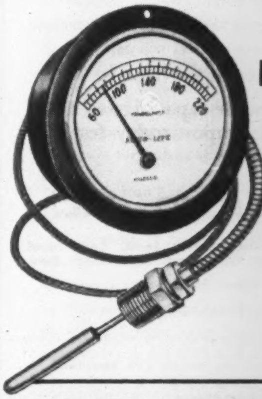
For Eye-Level Readings...

AUTO-LITE



Model 1000
TEMPERATURE RECORDER

This newly designed recorder has evenly calibrated, 6-inch chart... attractive die-cast case. Various standard ranges from minus 40°F to plus 550°F. Illustrated above is wall mounting type, with capillary tubing for remote reading. Also available with portable case with capillary and portable self contained. Obtainable with a cycle indicator for refrigeration.



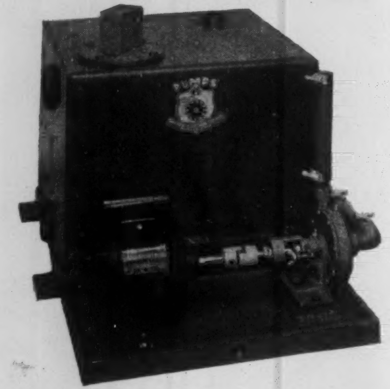
Model G
TEMPERATURE INDICATOR...

Wide selection of dial ranges. Various mountings to meet your needs. Send for new catalog of Auto-Lite Recording and Indicating Thermometers.

THE ELECTRIC AUTO-LITE COMPANY
INSTRUMENT AND GAUGE DIVISION
TOLEDO 1, OHIO
NEW YORK • CHICAGO • SARNIA, ONTARIO

Tune in "SUSPENSE!"...CBS Radio Mondays... CBS Television Tuesdays

Here's A Real Buy in CONDENSATE PUMPS!



The Eagan Eagle is your best buy from a performance, construction and price standpoint. It provides for more capacity than any similar pump at the same price . . . sells for only $124.00 (trade price F.O.B. Phila.)

Look at These Outstanding Features:

1. A low return inlet eliminates need for a pit even though return lines are as low as a foot above the floor
2. Capacity to 8000 sq. ft. EDR at 20 psi is obtained
3. The all bronze centrifugal pump has a non-clogging open impeller, stainless steel shaft, life sealed bearing
4. Flexible connectors and coupling isolate the pump, eliminate pipe cramp, misalignment, wear and noise
5. Thermal overload protection is provided
6. Base is heavy structural steel, drip-lip type with a ½" ips drain
7. Motor is standard ¼ hp, 115 volt, quiet capacitor type
8. A level indicating float switch is provided

Other models are available with capacities to 100,000 sq. ft. at 200 psi. Mail coupon today for free descriptive literature.

WALTER H. EAGAN CO., INC.

Mfrs. of Condensate, Vacuum, Turbine, Boiler Feed, Centrifugal and Proportioning Pumps and Fuel Oil Pump & Heater Sets.

Pump Specialists Since 1920

2336 Fairmount Ave., Phila. 30, Pa.

Send me literature and information on pumps I've checked.

☐ Condensate
☐ Vacuum
☐ Turbine
☐ Boiler Feed
☐ Centrifugal
☐ Proportioning
☐ Fuel Oil Pump & Heater Sets

NAME ....
COMPANY ....
ADDRESS ....
CITY .... ZONE ..... STATE ....

WHO'S WHAT . . .

[Continued]

For *UNITED STATES RADIATOR CORP.*—New manager of the Chicago Heights, Ill. plant is *RICHARD A. GREENE.*

For *THE NATIONAL RADIATOR CO.*—*GAYLORD W. BROWN* is manager of the Duncansville, Pa. plant. He has served as an industrial engineer for North American Aviation and Walt Disney Productions.

For *INSUL-MASTIC CORP. of AMERICA*—New representative in northeastern Ohio is the *C. W. POE CO.* of Cleveland.

For *MARLOW PUMPS*—*WILLIAM E. GALLAND* is district engineer for northern California. Mr. Galland will make his headquarters in the Sacramento area.

For *PERFECTION STOVE CO.*—New representatives for the commercial division are the *OHIO AIR CONDITIONING & HEATING CO.*, Cleveland, and *PERFECT AIRE, INC.*, of Cincinnati. Distributor for the Furnace Div. is *MANUFACTURERS SUPPLY CO.* of Youngstown, Ohio.

For *McQUAY INC.*—Representative for heating and air conditioning equipment in the state of Arizona is *CARNS, HOAGLUND & TURNER SALES CO.*, 1600 W. Jefferson, Phoenix.

The *ENTERPRISE HEAT and POWER CO.*, of Chicago, has been awarded a franchise as distributor of *WESTINGHOUSE* self contained and field assembled air conditioning equipment. The firm is headed by *H. A. NAFT* and *HARRY SHAFFER.*

For *SERVEL, INC.*—The *BOYD ENGINEERING CO., INC.* is distributor for air conditioning equipment in New Mexico and the trans-Pecos section of west Texas. The Albuquerque office of Boyd is at 112 Granite Ave., N.W., and the El Paso office is at 609 Laurel St.

For *PATCO MFG. CO.*—New manufacturers' representatives are: *CLEWELL EQUIPMENT CO.*, 11 S. Fullerton Ave., Montclair, N. J., in northern New Jersey, metropolitan New York and Long Island; *RAY E. LANDERS*, 915 N.B.C. Bldg., 815 Superior Ave., N.E., Cleveland, representative in Ohio with the exception of the Cincinnati area; *H. F. CLARKE & CO.*, 1114 Fifth St. West, Calgary, Alberta, Canada, representative in Alberta, Saskatchewan and Manitoba.

For *E. I. DU PONT de NEMOURS & CO.*—Two new technical representatives to handle sales of refrigerants to wholesalers. *JOHN A. LANDT*, formerly chemist's assistant at the Organic Chemicals Dept., has been as-

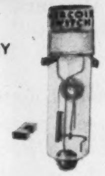
SEALED MERCURY CONTACTS

AN EXCLUSIVE FEATURE OF ALL MERCOID® CONTROLS

MERCOID SWITCH

TILTING TYPE

STATIONARY TYPE MAGNET OPERATED



VISIBILITY OF CONTACT ELEMENTS

It can be instantly noted whether circuit is "open" or "closed".

NO CONTACT CLEANING

The sealed mercury contact is immune to dust, dirt or corrosion.

YEARS OF TROUBLE-FREE PERFORMANCE

A Mercoid mercury switch can provide a million "makes" and "breaks" without deterioration.

THERE IS A MERCOID MERCURY SWITCH EQUIPPED CONTROL FOR EVERY PHASE OF AUTOMATIC HEATING

WARM AIR

Limit Controls • Fan Controls
Combination Fan & Limit

HOT WATER

Operating Controls • Limit Controls
Combination Circulator & Limit Control
Hot Water Supply

STEAM

Limit Controls
Operating Controls
Combination Pressure & Low Water

MERCOID SENSATHERM

Single and Dual Types
also Two-Stage Types

SAFETY CONTROLS

For Constant or Intermittent Ignition

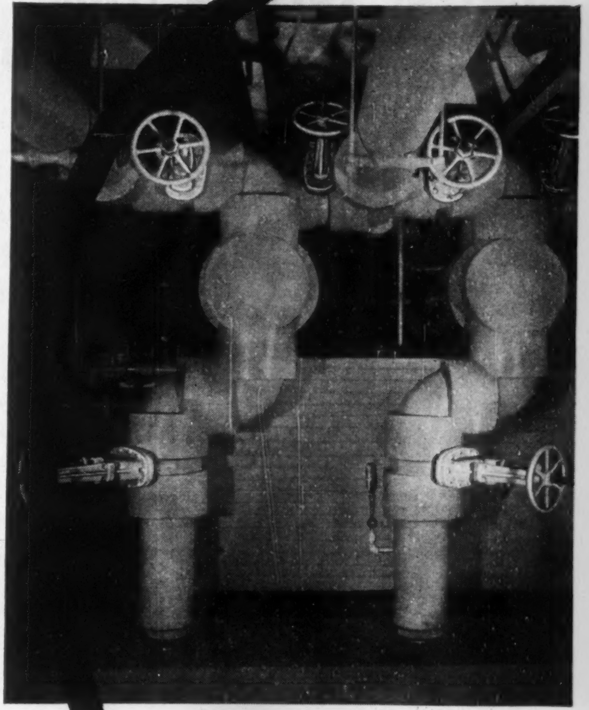
• YOURS FOR THE ASKING •

○ Handbook of oil burner controls ○ Catalog of complete line

○ Name and address of AUTHORIZED MERCOID AUTOMATIC CONTROLS REPLACEMENT EXCHANGE nearest you

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILLINOIS, U.S.A.
New York: 205 East 42nd St. ◆ Philadelphia: 3137 N. Broad St.

Proved DEPENDABLE



- **Call it reliable!**
- **Call it rugged!**
- **Call it dependable!**
- **If it is a Fairbanks valve . . . it has it!**

Thousands of installations under every condition from the simplest to the most difficult, prove Fairbanks valves give dependable service, require less maintenance, last longer — often succeed where other valves fail!

That is why you find more uninterrupted service, less shutdown, in plants that specify Fairbanks 125-pound Iron Body Gate Valves — the valves with proven dependability built in!

•

Fairbanks Iron Body Gate Valves are bronze mounted* both with inside non-rising screw and outside screw and yoke. Available with screwed or flanged ends. Bodies and bonnets made of high strength alloy cast iron. Wedges in 2" to 4" sizes of solid bronze; in larger sizes to 24", wedges are alloy iron with rolled in bronze face rings and bronze bushed stem connections. The threaded bronze seat rings are screwed into body at angle conforming to taper of wedge.

(*ALL IRON GATE VALVES ALSO AVAILABLE.)

THE Fairbanks COMPANY
393 LAFAYETTE STREET, NEW YORK 3, N. Y.
Branches: New York 3 • Pittsburgh 22 • Boston 10 • Rome, Ga.
TRUCKS • CASTERS • DART & PIC UNIONS • VALVES

These EVERLASTING advantages give better service from

BOILER BLOW-OFF VALVES

INLET
EVERL
ANG
VAL

Fig. 4001/6561. Duplex unit consisting of Straightway Lever-operated Valve and Angle Valve.

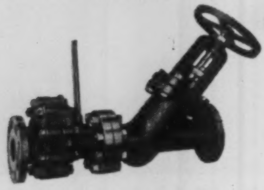


Fig. 4001/6571. Duplex unit consisting of Straightway Lever-operated Valve and "Y" Valve.

Fig. 657/6561. Duplex unit consisting of "Y" Valve and Angle Valve.

When you install an EVERLASTING Duplex Blow-Off Unit, you'll find that its many superiorities speak for themselves.

The valve at the left is the EVERLASTING design that has been famous for more than 40 years . . . the valve with the drop-tight seal that actually improves with use because of its self-lapping action each time the valve is opened or closed . . . the valve that can't stick or jam because of its non-wedge design . . . the valve that opens in less than a quarter turn to provide unimpeded straight-through blow.

The valve at the right is the equally famous EVERLASTING Angle or "Y" Valve, specially designed and equipped to withstand repeated blow-off shocks, erosion and corrosion, and without pockets that might trap and hold solids.

Each of these valves . . . and all the other EVERLASTING Boiler Blow-Off valve types, fully meet ASME code requirements . . . assurance that they are properly designed and amply strong for the service.

Write for descriptive bulletin.

EVERLASTING VALVE CO., 61 FISK STREET, JERSEY CITY 5, N. J.

Everlasting Valves

TRADE MARK "EVERLASTING" REG. U.S. PAT. OFF. EV365

FOR EVERLASTING PROTECTION

WHO'S WHAT . . .

[Continued]

signed to the Wilmington territory which includes Delaware, Maryland and Pennsylvania. *JOHN K. WORTHINGTON* has been assigned to the territory comprised of Missouri, Colorado, Kansas, Oklahoma. His headquarters will be Wichita, Kans.

A distributorship in Louisville, Ky. is to be established for test purposes under the temporary control of *CARRIER CORP.* This distributorship will be headed and partly owned by *ARTHUR P. SHANKLIN*, for many years a vice president of Carrier.

For *OHIO BRASS CO.*—Valve sales representative in Washington and Oregon is *WILLIAM A. MATZKE*, 809A Terminal Sales Bldg., Seattle 1.

For *SCAIFE CO.*—*W. T. BRYSON* is sales supervisor of District 5 with headquarters in Atlanta and will cover the states of North and South Carolina, Georgia, Alabama, Mississippi and Florida. *DEAN WAGONER*, with headquarters in Greensboro, N.C., continues to represent Scaife in District 5 in the sale of gas cylinder products in North and South Carolina. *FRANK F. BROWN* has been appointed sales representative in the New York territory.

For *BALDWIN-HILL CO.*—*DAVID M. WILLIAMSON* has been advanced to the position of area manager for industrial sales. He will be located at the Huntington, Ind. plant and will have charge of the midwest sales force.

For *ROBERTSHAW-FULTON CONTROLS CO.*, Fielden Instrument Div.—*HOYT-GRANT CO., INC.*, P.O. Box 6157, New Haven, Conn. is sales representative in Connecticut and several counties in Massachusetts. *NICK RUGE SALES CO.*, 1001 E. New York St., Indianapolis, is sales representative in southern Indiana. *K. P. KNUDSEN & CO.*, 305 Techwood Dr., N.W., Atlanta 3, is sales representative in the state of Georgia. *OTTO J. LEONE*, 1918 Investment Bldg., Pittsburgh, is sales representative in western Pennsylvania and the northern half of West Virginia.

For the *SPORLAN VALVE CO.*—New sales and service engineer on the west coast is *JOHN A. HOGAN*. He will make his headquarters in Los Angeles.

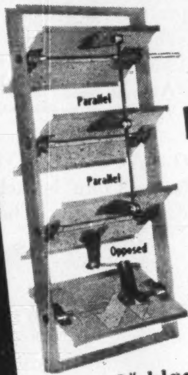
For *JANITROL* domestic-commercial division of *SURFACE COMBUSTION CORP.*—*EDWIN B. FREDERICK* is sales representative in the central New Jersey territory. He will operate out of the New York office under the direction of *K. G. HULL*, regional manager, and will be associated with *H. E. HICKS*.

For *CARRIER CORP.*—*GUY STOLTZ*, for three years manager of the Houston, Texas office, has been named manager of the Jacksonville, Fla. office. Mr. Stoltz

SAVE TIME, MONEY and MAINTAIN TOP QUALITY DURO-DYNE PRODUCTS

"DURO-BLADE KIT"

precision engineered DAMPER HARDWARE

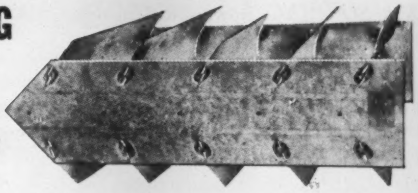


- Swiftest, simplest assembly
- Ideal for light or heavy dampers, 3" blades or wider
- Corrosion-resistant throughout
- Parallel or opposed blade action
- Can be screwed, bolted, riveted, welded, spot welded

"DURO-VANE RAIL"

new, speedy, accurate way to make engineer-approved AIR TURNING VANES

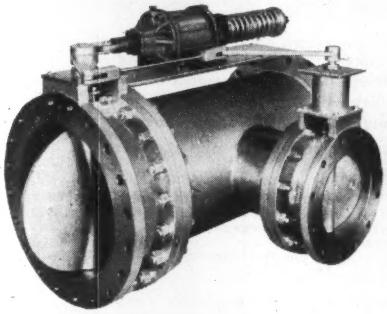
Installed Cost cut 50% to 70%

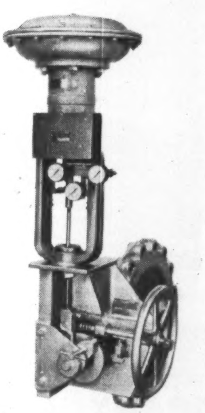


- Completed Turning Vanes meet engineering specifications
- Duro-Vane Rail lies flat in duct
- Eliminates layout
- Shipped bundles of 8 ft. rails, including special broad point chisel

WRITE for Free new "Visual" Manual

DURO-DYNE CORPORATION
Dept. A, 800 3rd Ave. • New Hyde Park, N. Y.



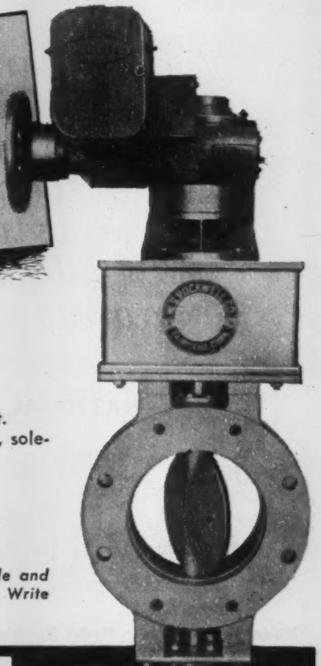


Three-way 50 lb. A.S.F. butterfly valve with 24" pipe on run and 14" on branch; linked together to close one valve when the other opens; operated by a spring loaded hydraulic cylinder; for air and exhaust gases up to 60 p.s.i. and 350° F.

•

16" wafer type butterfly valve with air diaphragm operator, valve positioner and auxiliary declutchable manual control.

All YOU COULD EXPECT OF A TRULY BETTER VALVE!



Engineered for...

Positive, Tight Closure—even air or bubble tight.
Automatic Control—electric, air, hydraulic, float, solenoid, etc. Or manual control, if desired.
Pressures—to 300 p.s.i. and higher.
Temperatures—from sub-zero to 2000° F.
Materials—made of any metal or rubber lined.
Sizes—from 1" to 120" diameter, and larger.

We also manufacture wafer type butterfly valves; slide and gate valves; proportioning valves; swing check valves. Write for Catalog.

W. S. ROCKWELL VALVES

W. S. ROCKWELL COMPANY
2544 Eliot Street • Fairfield, Conn.

Butterfly valve with outboard roller bearings, electric motor operator and auxiliary handwheel control, for high velocity air at 125 p.s.i. and temperatures from minus 20° to plus 200° F.

WHO'S WHAT . . .

[Continued]

replaces *N. F. RATHBUN*, who has been assigned to the Houston office. *EUGENE H. WILSON* of Decatur, Ga. has been appointed district merchandising manager for room units and ice makers. His headquarters will be in Atlanta and he will work with distributors in Georgia, Florida, Alabama and Tennessee.

For *CARLON PRODUCTS CORP.*—*JOSEPH T. RYERSON & SON, INC.* now is distributor for Carlon's plastic pipe and fittings.

For *ILLINOIS ENGINEERING CO.*, Div. of *AMERICAN AIR FILTER CO., INC.*—New representatives are: *CHARLES R. HOLSCLAW*, Charleston, W. Va.; *HOWARD V. CATON CO.*, Charlotte, N. C. ; *RICHARD K. HUNTER CO.*, Greensboro, N. C.; *PFAU-VOGEL CO.*; Indianapolis, Ind.; *INTERNATIONAL MFG. CO.*, Denver, Colo.; and *RUSSELL H. SMITH EQUIPMENT CO.*, Columbus, Ohio.

For *C. A. DUNHAM CO.*—New representative for Phoenix, Ariz. is *CARNS, HOAGLUND and TURNER CO.*

FAIRMOUNT ALUMINUM CO. has announced the opening of new sales offices to serve the midwest area with headquarters at 4013 N. Milwaukee Ave., Chicago. *W. BRADLEY BLAIR* is Chicago district manager for the sales territory covering four states.

For *WOLVERINE TUBE DIV.* of *CALUMET & HECLA, INC.*—New sales offices in several cities. New offices in Kansas City, Mo. are at Room, 208, Broadway-Westport Bldg., 4050 Broadway. Offices in Philadelphia have been moved to larger quarters at Room 1408, Liberty Trust Bldg., Broad and Arch Sts. Sales offices which were recently moved in St. Louis now are at Room 207, Larson Bldg., 25 S. Bemiston Ave.

For *SIMS PUMP VALVE CO.*—*NUTMEG INDUSTRIAL SUPPLIES, INC.* of New Haven, Conn. is exclusive distributor for Sims products in Connecticut. The new company is headed by *MICHAEL J. DORNEY*.

For *YORK-SHIPLEY, INC.*—*HAROLD H. WILKINSON* is a manufacturer's representative for the general division. Mr. Wilkinson will handle private label sales in Pennsylvania, Maryland, Delaware and New Jersey.

For the *TRANE CO.*—Three new sales representatives are: *PHILLIP D. FREEMAN*, who has been assigned to the St. Paul, Minn. sales office; *RICHARD E. JAMESON*, who joins the Des Moines, Iowa, office; and *DENNIS W. NELSON*, who has been assigned to the Billings, Mont. office.

The big team of **NATIONAL CHAMPIONS** *with the power and versatility to meet all your heating needs*

200,000 to 2,000,000 BTU

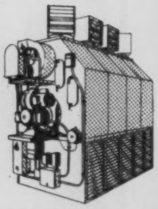
Whatever your heating need—large space heating, tempering make-up air, curing, drying or de-icing—there is a National Champion direct fired heater with the money-saving power to do the best job National Champions satisfy the toughest industrial requirements.

A fine combination of quality construction and solid engineering, National Champion heaters feature:

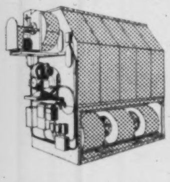
- 80% heating efficiency.
- completely automatic controls—for constant, clean heat.
- teardrop design, stainless steel firebox—easy to clean and service.
- burners for light and heavy oils, gas and combination fuels—whichever is most economical for you.
- listing by Underwriters' Laboratories, Inc.

National Champion direct fired heaters are completely wired and assembled at the factory. All are carefully flame tested by National's "Trial by Fire" to assure peak performance after installation.

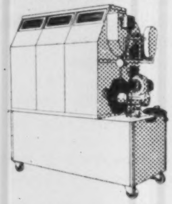
NATIONAL CHAMPION HEATERS—Many models—many sizes



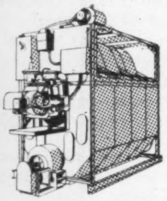
Model H—vertical unit with discharge heads. 12 sizes.



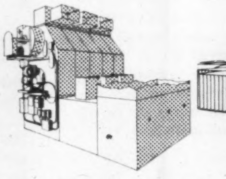
Model D—vertical unit for duct work. 12 sizes.



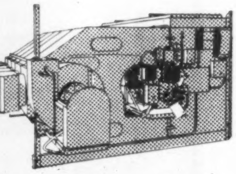
Model P—portable, vertical unit for flexible duty. 6 sizes.



Model R — inverted unit with discharge heads at bottom. 12 sizes.



Model S—vertical unit with side blowers to permit proper location of air mixing dampers. 12 sizes.

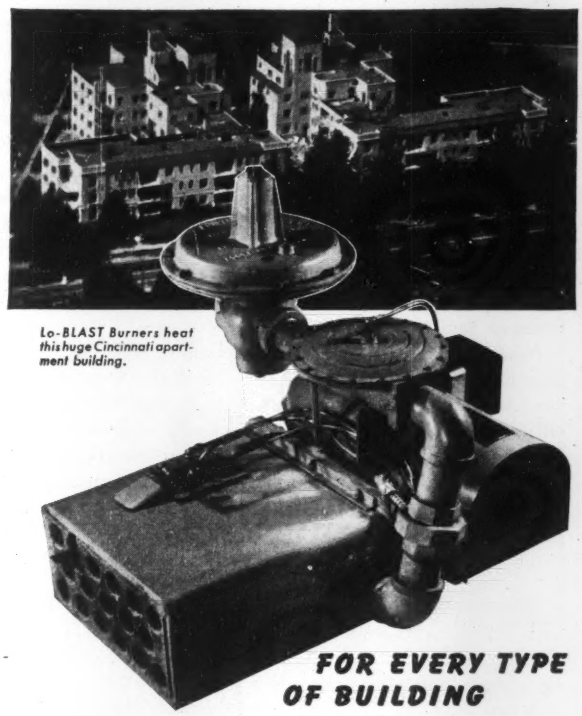


Model C—horizontal ceiling suspension unit for space saving. 12 sizes.

Write today for complete information and specifications.

NATIONAL HEATER COMPANY, INC.

2180 Cleora Avenue, St. Paul 4, Minnesota



Lo-BLAST Burners heat this huge Cincinnati apartment building.

LO-BLAST

IS THE LOW-COST WAY TO HEAT WITH GAS

Every dollar trimmed from operating expense shows up on the profit side of the ledger. That's why fuel-saving Lo-BLAST Power Gas Conversion Burners are the sensible selection for buildings which must produce income . . . or for home owners concerned with keeping living costs down.

Lo-BLAST operating cost averages 10% less

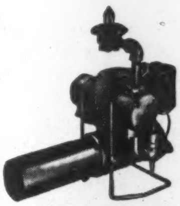
The Lo-BLAST principle of combustion utilizes an extremely quiet, low speed blower to provide perfectly controlled primary and secondary air. Hence operation is always independent of natural draft conditions—makes the Lo-BLAST ideal for down-draft boilers. Combustion is completed in an incandescent firebox, with radiant heat applied to the crown sheet as well as side walls. There's no combustion roar—the flame is soft and *quiet!*

High efficiency on intermittent operation

Lo-BLAST Burners show only a small drop in over-all efficiency when changing from constant to intermittent operation. This is the reason for Lo-BLAST fuel economy, since intermittent operation is the normal condition for any heating plant.

Factory-tested on gas, shipped completely assembled

Installation and servicing are easy *because there's nothing in the firebox but the fire!* All units have standard controls with positive acting pilot and blower safetys.

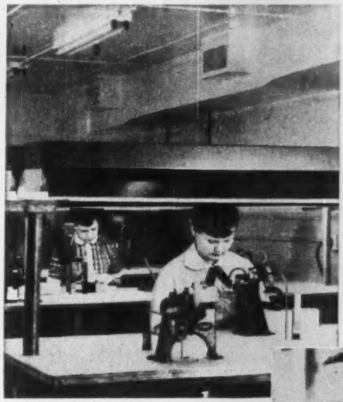


Lo-BLAST Economite
Residential size—70,000 to 500,000 BTU—with all the fuel-saving features of the standard Lo-BLAST.

Capacities from 70,000 to 20,000,000 BTU input. Write for engineering data.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

You can have DRY AIR with exact moisture control..



Assembling Electronic Parts

FOR
YOUR COMFORT
FOR
YOUR PROCESS
FOR
TESTING MACHINES
OR MATERIALS AT
ANY TIME OF
THE YEAR

Packaging Food Products

Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

Write for Bulletins 112 and 122

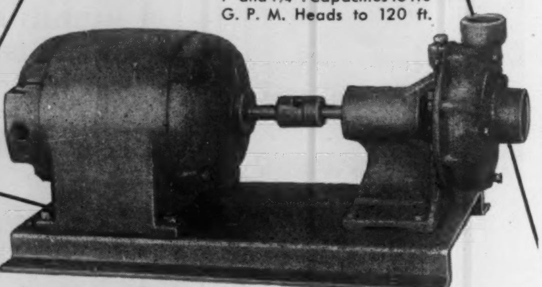
NIAGARA BLOWER COMPANY

Dept. HP, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

New Goulds "support head" centrifugal pump for AIR CONDITIONING installations

Goulds Fig. 3742—Sizes 1" and 1¼". Capacities to 110 G. P. M. Heads to 120 ft.



This compact Goulds pump saves space, and cuts installation, operation, and maintenance costs. It's designed especially for air conditioning installations, but also offers advantages for booster, condensate, and other services.

FLEXIBLE—Discharge may be located in any one of eight positions. May be driven by belt or directly connected to motor or other driver. Drain, vent and priming openings provided.

COMPACT—You can fit this pump unit into virtually any layout.

QUIET—Balanced impeller, the only moving part, assures minimum noise and wear.

SIMPLE—Mechanical seal prevents leakage, but does not bind shaft or require adjustment or periodic maintenance. Vertically split casing permits inspection without disturbing piping connection.

Only change of impeller and casing necessary to convert from one size to the other.

For full details, specifications, performance curves send for Bulletin 625A3.

Goulds PUMPS INC.
Seneca Falls
New York

WE HEAR THAT . . .

Heating equipment designed to assure freedom from smoke and soot was unveiled at the opening of the first *ANTHRACITE INDUSTRY COMMERCIAL EQUIPMENT SHOW* at the Architect's Bldg., 101 Park Ave., New York. The show opened January 19 for two months. These new automatic anthracite burners provide more efficient and convenient methods of burning hard coal, without smoke or soot. New York City building operators have expressed interest in the new units after test installations in various areas.

New York City smoke control officials, Board of Education Engineers, federal engineers from the General Services Administration, New York City budget officials, Post Office engineers, leading architectural, engineering and real estate representatives were on hand for the opening. Manufacturers of these automatic anthracite units together with representatives of the hard coal industry were also present.

Effective January 1, the Equipment Div. of J. F. Pritchard and Co. became known as the *J. F. PRITCHARD CO. of CALIFORNIA.* Other divisions will continue to be known under the company name of J. F. Pritchard and Co.

The *C. A. DUNHAM CO.* last month sent out a mobile demonstration unit for a year-long nationwide tour. A large trailer called "Products on Parade" contains operating and cutaway models of the company's steam and hot water heating equipment. Local sales representatives and a representative from the Michigan City, Ind. plant will be on hand to conduct tours through the trailer.

The *DETROIT CONTROLS CORP.* has announced the purchase of the Belknap Mfg. Co. of Bridgeport, Conn. Belknap, producers of bronze valves, fittings and castings, will carry on operations under its present name as a division of Detroit Controls. Policies and operating personnel of both companies remain unchanged.

A two-week school for distributor service personnel has been scheduled by the air conditioning division of *SERVEL, INC.* To be held at the factory in Evansville, Ind., the school will run from March 15 through March 27. The program will include the service and maintenance of year 'round air conditioning equipment, water chillers and self contained electric units. A similar program was offered in February.

"The Science of Making Brass," a 16 mm color documentary film produced for *CHASE BRASS & COPPER CO.*, a subsidiary of Kennecott Copper Corp., recently was awarded first prize at the International Film Festival in Turin, Italy. The film runs for 29 minutes and makes extensive use of animation, diagrams and close-up shots of the casting, extrusion, drawing and rolling processes used in the manufacture of sheet, rod, wire and tube.

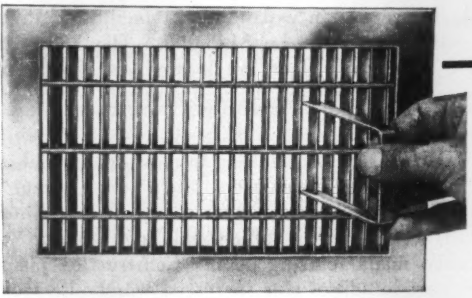
You can be sure of safe, dependable air distribution

when you

Specify and Install

R & G

REGISTERS and GRILLES



SOLID BAR TYPE GRILLES AND REGISTERS

Designed for the job where performance and quality are the first consideration. They are found in America's finest Schools, Hospitals and Public Buildings.

- **Fixed or with Horizontal, Vertical adjustment.**
- **TAMPERPROOF and KICKPROOF. Built to withstand abuse.**
- **Easily adjustable with special tool provided.**
- **Interlocking Cross Bars for added strength.**
- **Available in various types of electroplating.**
- **Single or Double deflection.**
- **Constructed of solid 14 gauge Steel bars.**

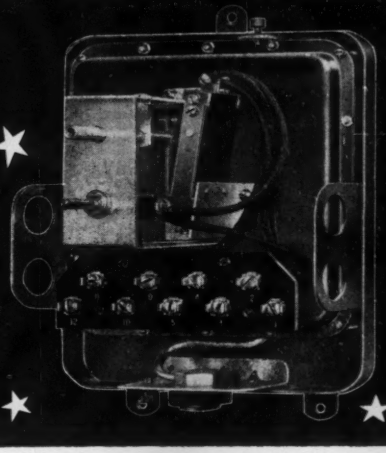
81 STYLES OF PERFORATED GRILLES.

Complete Line of Registers and Grilles for
HEATING • VENTILATING • AIR CONDITIONING
Catalog on Request

REGISTER & GRILLE MFG. CO., INC.
70 BERRY STREET, BROOKLYN 11, N. Y.

"IT'S HERE..."

THE NEW PERFEX DRAFT CONTROL



GIVES YOU...

- *Improved Performance*
- *Greater Fuel Economy*
- *Increased Efficiency*
- *Wider Range*

THIS new improved Perfex Draft Control is the key to greater heating efficiency and economy. Cuts fuel consumption — eliminates excessive heat losses — abates smoke. Draft Control causes Actuator to reposition damper and automatically maintains proper draft rate. Has new, more sensitive switch — more simple in design and faster in operation. For coal, gas and oil burning applications.

A COMPLETE VERSATILE SYSTEM

◄ THE DRAFT CONTROL

THE DRAFT GAUGE ►

◄ THE PROGRAM CONTROL

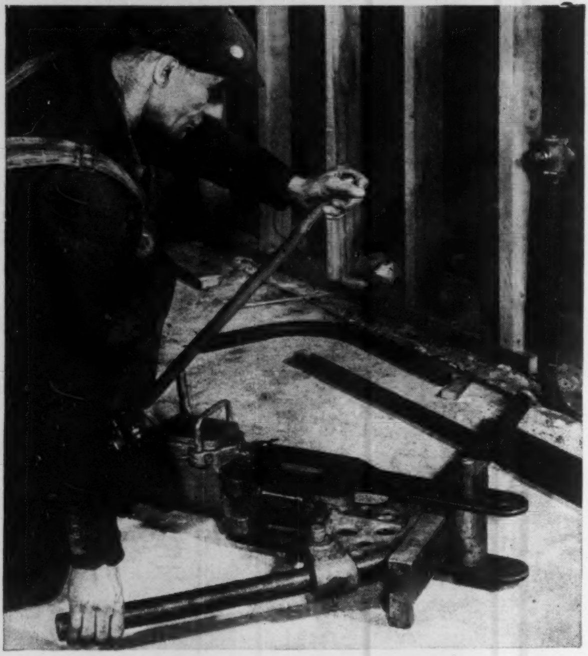
THE ACTUATOR ►

PERFEX

Perfex Corporation, Milwaukee, Wis.
In Canada, Perfex Controls Ltd., Guelph, Toronto 1

AUTOMATIC CONTROLS FOR HEATING • AIR CONDITIONING • APPLIANCES

RADIANT HEATING PIPE
BENT QUICKLY, ACCURATELY
WITH GREENLEE PIPE BENDER



Install radiant heating pipe the timesaving, accurate way . . . with the GREENLEE 770-R Hydraulic Pipe Bender. With it one man *in a few minutes* can make 90° and return bends in *cold* pipe of sizes ½", ¾" , 1",1¼", 1½" and 2". Operation is simple, quick. The GREENLEE is compact, portable . . . easy to carry, set up and operate exactly where and when needed. And it is specially designed to produce *accurate duplicate bends* so that the entire series of bends has smooth uniformity throughout. Do the job easier, faster, *better* with a GREENLEE Bender. Write for free Bender booklet.

TOOLS FOR CRAFTSMEN
GREENLEE
G

Greenlee timesaving tools for plumbing and heating work . . . Hydraulic Pipe Benders Tubing Benders • Hydraulic Pipe Pushers • Pipe Bits • Auger Bits • Spiral Screwdrivers • Chisels and many more. Write for details. Greenlee Tool Co., 2343 Twelfth Street, Rockford, Illinois.

WE HEAR THAT . . .

[*Continued*]

Another film produced by the company, "The Story of Radiant Heating," shows each step of an actual heating installation and illustrates the principle of radiant heating.

Requests for loan of the films should be addressed to Chase Executive Offices, Waterbury 20, Conn., or to Chase warehouses and sales offices.

The *G. C. BREIDERT CO.*, Los Angeles ventilator manufacturer, has moved to a recently completed factory on San Fernando Rd., Pacoima, Calif. The new plant gives the firm more than five times it former manufacturing area. The new mailing address is P.O. Box 1190, San Fernando, Calif.

DRAVO CORP. has purchased a tract of approximately 60 acres along the Ohio River at Leetsdale, Pa., for possible future use in expanding its facilities. Purchase price was reported to be $175,000. The corporation's shipyard and main plant are located on Neville Island four miles upstream from the new property.

RUUD MFG. CO. is planning to move its general offices from Pittsburgh to Kalamazoo, Mich. In a recent letter to stockholders, Ruud management revealed its intention to construct a general office building adjacent to its Kalamazoo manufacturing plant. Construction plans call for the new building, plus increased warehouse facilities, to be available late in 1954.

A manufacturing agreement has been concluded between the *BABCOCK & WILCOX CO.* and the *SEABOARD REFRACTORIES CO.* under which Seaboard's entire manufacturing facilities will be devoted to producing special refractories for Babcock & Wilcox. Seaboard will discontinue its own sales activities and sales will be handled by Babcock & Wilcox.

REYNOLDS METAL CO.'s new Robert P. Patterson aluminum reduction plant, located near Arkadelphia, Ark., now is in operation. The facility, named in honor of the company's late vice president and director, has an annual rated capacity of 110 million lb of virgin aluminum. *J. W. HUTCHINSON* is manager of the new plant which cost an estimated $34 million. About 400 workers will be employed when the plant reaches full production.

CHRYSLER AIRTEMP has announced the expansion of sales, application and service training programs for factory, distributor and dealer personnel. Basic training programs have been instituted for company personnel and for field sales personnel.

L. J. WING MFG. CO. has been awarded a contract by the U.S. Navy in the amount of $1,500,000 for airfoil fans of the vaneaxial and tubeaxial type for ship ventilation.

Simple, practical ventilation for many kinds of buildings

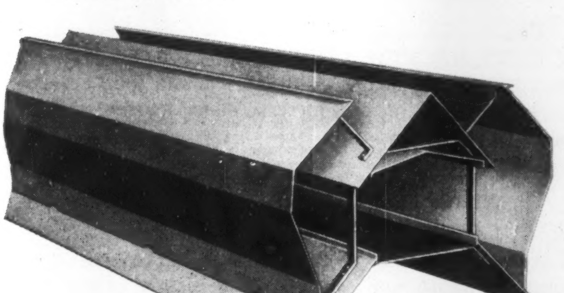
Swartwout-Dexter Heat Valve

The *original* continuous ventilator

The Heat Valve as developed and improved by Swartwout has proved to be one of the most adaptable ventilator designs. Originally applied principally to ridge peaks, its use on slopes or flat roof surfaces has become common. Popular uses in the smaller sizes include saw-tooth construction and skylights.

Heat Valve is designed for maximum capacity with lowest friction, and greatest assistance from outside air currents. It provides practically any area of roof opening desired, at economical cost. Can be quickly and easily installed. Always weatherproof, with fully adjustable damper for exhaust control when needed. Various damper operating methods are available.

Swartwout-Dexter Heat Valve is made in 10 throat sizes, in standard 10 ft. lengths. Can be made of special materials when acid or fume conditions prevail . . . Get the full story — write for Bulletin HV-F.



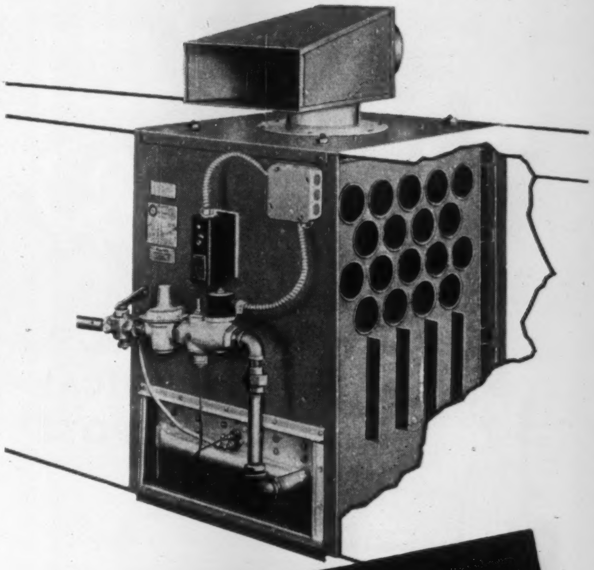
Low overall height of Heat Valve enhances appearance — is an advantage structurally.

18511 Euclid Avenue, Cleveland 12, Ohio

The Swartwout Co.

Roof Ventilators and Ventilating Louvers

POWER PLANT EQUIPMENT • PROCESS INDUSTRY CONTROLS



You Can Solve Any Duct Heating Problem with the REZNOR Duct Furnace

Reznor duct furnaces simplify the design and installation of specially engineered air-conditioning jobs. With the duct furnace as the automatic heat exchanger, you can use impelling, cooling, air cleaning and humidification equipment of the type and capacity best suited to each specific situation.

The Reznor duct furnace can be installed either singly or in multiples, in tandem or duct line spacing. It is preferred by heating engineers because it provides for air flow through the unit in either direction – permitting installation in the duct with the controls on the most accessible side. The draft diverter is of the horizontal discharge type and can be rotated a full 360°. To increase ease of inspection and service, the burner assembly is mounted in an easily removed drawer.

Design and construction for high temperature operation make it perfectly suited for rugged drying and curing applications. The heat exchanger is suspended in the case so that the air flow completely surrounds it. This guarantees extremely high efficiency without overheating of the case.

This versatile heater is available in 85, 100, 150 and 200 thousand BTU models. For complete details, dimensions and specifications see the Reznor Catalog in Sweet's Architectural and Industrial Construction Files or write to the **Reznor Manufacturing Company, 51 Union Street, Mercer, Pa.**

THE WORLD'S LARGEST-SELLING GAS UNIT HEATER

REZNOR HEATERS

LOOK TO *Jacuzzi* . . . FOR ECONOMICAL ALL PURPOSE

CENTRIFUGAL PUMPS

PRECISION ENGINEERED for air conditioning and hot water circulating

You can count on Jacuzzi's compact, dependable utility pumps for jobs like circulating water in air conditioning systems, food processing plants, cooling towers, swimming pools...ideal, too, for sprinkling lawns and hot water circulating.

Can be mounted at any angle with six different discharge positions. Horsepower ratings from 1/4 through 5 H.P. Electric motor, belt or gas engine drive.

Low cost. Simple in design. Highly efficient. Each unit built with the same engineering know-how and ruggedness that has made Jacuzzi the world leader in centrifugal-jet pumps. Don't settle for less.

Get the facts!

Write for detailed bulletin "JGP-2."

Jacuzzi BROS. INC.
RICHMOND, CALIFORNIA

Also:
St. Louis 23, Missouri • Binghamton, New York
Portland 14, Oregon • Monterrey, Mexico

WE HEAR THAT . . .

[Continued]

Three Pennsylvania colleges will share in the annual $12,000 *DRAVO CORP.* scholarship program recently announced. Arrangements have been completed for awards at Carnegie Institute of Technology, Lehigh University and the University of Pittsburgh. The program provides for two upper-division scholarships in each of the three schools.

The Newcomen Medal, given only three times before in the history of the United States branch of the Newcomen Society, has been awarded to *WILLIAM H. ROWAND*, vice president of the Babcock & Wilcox Co. Mr. Rowand received the award in recognition of his invention of the cyclone steam separator. The society was founded in England.

A demonstration and explanation of the latest light metal brazing techniques is shown in a new color movie produced by the *ALUMINUM CO. of AMERICA.* "New Horizons in Aluminum Brazing," a 22 minute, 16 mm sound film, gives a comprehensive glimpse of the advantages that brazing provides in the design and fabrication of aluminum products.

More than 400 *TRANE* convectors have been installed in the new $4 million Resurrection Hospital in Chicago.

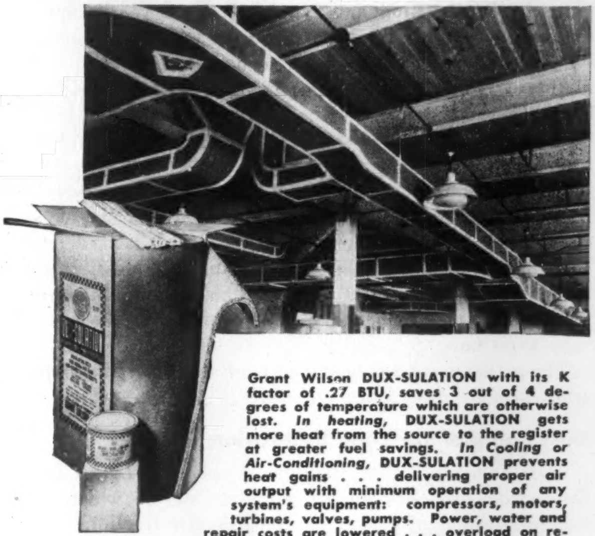
At the end of December 1953, *FEDDERS-QUIGAN CORP.* had received orders for approximately 200,000 room air conditioner units for 1954. According to *SALVATORE GIORDANO*, president, these orders exceed the total number produced and shipped during the last fiscal year. Of these orders, about 50 percent are for Fedders brand distributors' accounts and the remainder represent contract production for Crosley and RCA Victor.

Construction soon will be completed on a new plant for *LANDIS MACHINE CO.* in Waynesboro, Pa., to be devoted to the production of collapsible and solid adjustable taps. The building will increase manufacturing and office area by 60 percent.

Showing its civic pride, *MINNEAPOLIS-HONEYWELL REGULATOR CO.* has filmed the story of the Minneapolis Lakers, sometimes called the world's greatest basketball team. The 16 mm sound motion picture called, "Meet The Champs," is being made available for showing through the firm's branch offices.

PITTSBURGH PLATE GLASS CO. has announced that a 45-acre tract near Pittsburgh has been purchased as the future location for a glass research laboratory. The firm's glass research program is being reorganized and expanded under the direction of *DR. S. FRANK COX*, director of glass research.

STOP Temperature Loss!



Grant Wilson DUX-SULATION with its K factor of .27 BTU, saves 3 out of 4 degrees of temperature which are otherwise lost. *In heating,* DUX-SULATION gets more heat from the source to the register at greater fuel savings. *In Cooling or Air-Conditioning,* DUX-SULATION prevents heat gains . . . delivering proper air output with minimum operation of any system's equipment: compressors, motors, turbines, valves, pumps. Power, water and repair costs are lowered . . . overload on refrigeration equipment relieved.

Other Advantages of Dux-Sulation on Duct Work: Condensation Prevention, Sound Absorption, Lower Surface Friction, Permanence, Good Appearance, Economy of Installation, Dependable Safety.

STOP Noise!

Grant Wilson
Flexi-Duct

Grant Wilson Woven Asbestos FLEXI-DUCT Tape stops noise and vibrations in all duct systems by isolating them at their source. Mechanical rattles, starting and stopping screeches, shaft whine, fan hum . . . all natural attendant noises to a blower's operation . . . can be confined to the blower housing by incorporating a flexible joint made of FLEXI-DUCT tape. Installation of such a joint is simple . . . tape or bolt FLEXI-DUCT to equipment and duct work with little time and effort. Network of ducts can be easily sectionalized . . . positively precluding sound travel by conduction . . . by interspersing FLEXI-DUCT joints throughout.

USED IN *STORES • OFFICES • HOSPITALS • THEATRES • INDUSTRIES • HOMES*

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Grant Wilson inc.
ASBESTOS and INSULATING MATERIALS
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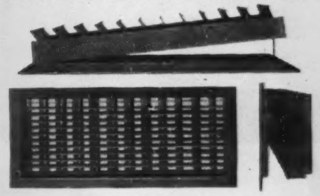
when in the dark...
Look to
Stewart
for Outstanding New Advances in
Air Conditioning Outlets

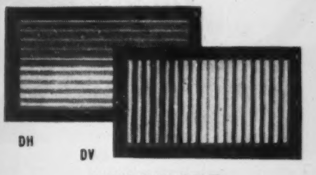
REGISTERS
GRILLES
SCOOPS
by
Stewart

In this Complete Catalog . . .

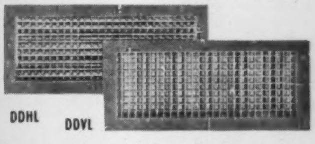
For Quality, Originality, Economy and Fast Delivery—your best choice is Stewart for Industrial and Commercial Registers — Grilles and Air Controls. You'll find one to suit your every need in the new 28 page Catalog #53.



SCOOPMASTER
Eliminates sheet metal collar—directs and controls air

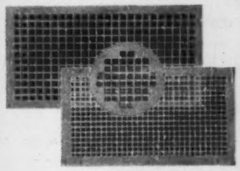


SINGLE BANK OUTLET



Triple Bank Registers Individually Adjustable Fins

Opposed-Action Valves
optional with all Supply and Return Air Registers.



PLAIN LATTICE GRILLES

SCOOPTROL
Deflects and controls the air from a supply duct into a collar

Stewart MANUFACTURING CO., INC.
Grove Ave., Essex County, Cedar Grove, N. J.

2241

Representatives in the Principal Cities of United States, Canada and the West Indies.

STOP VIBRATION

with
KORFUND
VIBRATION
CONTROL

The photograph shows five of a total installation of 324 Clarage Heavy Duty Fans at The Upjohn Company's new pharmaceutical plant at Kalamazoo, Mich.

Korfund Twin Rail Bases under each fan and motor keep noise and vibration from reaching working areas through the steel deck or through the air conditioning ducts, and make possible this simple, space-saving installation on suspended platforms and structural steel members under the roof.

Korfund Duplex Twin Rail Bases have separate rails for fan and motor, and are completely adjustable—on the job—to take care of any drive center distance, motor position, bolt location or other variables. Built-in chocks assure positive alignment. Light weight, they are easier to handle. Base Drawings are immediately available for most fans and motors. And, because of standardization, long production runs reduce cost and permit quick deliveries.

For installation of fans, pumps, compressors, refrigerating and other types of mechanical equipment for both normal and critical operating conditions, basic isolation recommendations are given in Bulletin No. 15. Write for your free copy today, or see our catalog in Sweet's Files. Write, too, for one of our free Belt-Center Distance Calculators—it's a real time saver.

If you have a specific problem, we will be glad to submit recommendations without obligation. A half century of experience is at your disposal. Representatives in principal cities.

THE KORFUND CO., INC.

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SPRINGS RUBBER CORK

48-01F Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

NEW BOOKS & REPORTS . . .

Ventilation for Ship Construction

In the construction and repair of ships, ventilation is required to avoid health hazards during welding and painting operations. To point out the need for adequate ventilation during spray painting on ships, George S. Reichenbach, Jr., Industrial Hygiene Engineer, Bethlehem Steel Co., Sparrows Point, Md., has written *Ventilation—For Ship Construction and Repair.*

The author found that in the spraying of deep tanks it is seldom possible to furnish sufficient ventilation to enclosed areas of ships to eliminate the health hazard from solvents and diluents. He concludes that it is possible and mandatory to ventilate at a rate which maintains the area free from explosive hazards, and recommends the use of vane axial fans.

The article has been reprinted from the *American Industrial Hygiene Association Quarterly.*

Dust Sampler for Lung Deposition

Dust Sampler Which Simulates Upper and Lower Lung Deposition discusses an air sampling device which will obtain a sample of dust in two particle size fractions. The fraction containing the larger particles simulates in particle-size spectrum that portion of the material which should be retained by the upper part of the respiratory tract. The study was based on the premise that there is considerable evidence that the toxicity of the dusts and fumes of many substances varies according to the particle size distribution of the airborne material.

Authors of the article are W. B. Harris, chief, Industrial Hygiene Branch, Health and Safety Div., and Merril Eisenbud, director, Health and Safety Div., New York Operations office, United States Atomic Energy Commission.

The article appeared in the *Archives of Industrial Hygiene and Occupational Medicine*, published by the American Medical Association, 535 N. Dearborn St., Chicago 10.

Liquid Heating of Plastics Processing Machinery

New Developments in Liquid Heating of Plastics-Processing Machinery is a reprint of an address delivered by Paul L. Geiringer, chief engineer of the American Hydrotherm Corp., at a recent meeting of the American Society of Mechanical Engineers. Mr. Geiringer and co-author Floyd Hasselriis discuss the principles underlying the successful application of liquid heat transfer media to the heating and cooling of plastics calenders, extruders, injection molders and presses, and shows the advantages of liquid heating over other methods.

Copies of the reprint are available from the American Hydrotherm Corp., 33-70 12th St., Long Island City 6, N. Y.

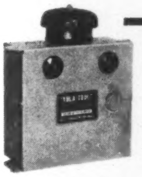
New York State Construction Code

The *State Building Construction Code Applicable to Multiple Dwellings* represents the completion by the State Building Code Commission of New York of rules and regulations for all types of residential buildings. The code provides all municipalities of the state, at their option, with rules and regulations covering 88 percent of all new projects on which permits are issued. The remaining 12 percent of construction projects represented by non-resi-

SERVING THE HEATING INDUSTRY SINCE 1926

Yula

A Complete Line of Dependable Heat Exchangers



Yula-trol Relay box and alarm

Get DOUBLE* PROTECTION for your oil burner installations with . . .

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FUEL OIL DETECTOR

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Yula "YT" "U" Tube

FUEL OIL HEATER

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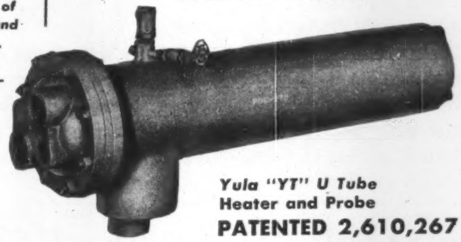

Yula "YT" U Tube Heater and Probe

PATENTED 2,610,267

- * **Protects system from serious damage, in case of an oil leak in the Pre-heater, by shutting off oil burner, sounding an alarm, flashing on a red light.**
- * **Acts as a Low Water Cut-off**

RESULT: Heating System protection at low cost

OTHER *Yula* PRODUCTS

TYPE "M" MIXING VALVE Automatically mixes hot and cold water or other fluids. Delivers it at any predetermined constant temperature.

INSTANTANEOUS HEATERS . . . Ideal for domestic and industrial applications where large volumes of hot water or other solutions are needed for service water supply or process work

CONVERTERS . . . For water in tubes, steam in shell, or water to water applications. "U" tube bundle construction simplifies cleaning.

DRY EXPANSION FREON COOLERS . . . Designed for air conditioning, refrigeration, and industrial and process uses for cooling water or other liquids.

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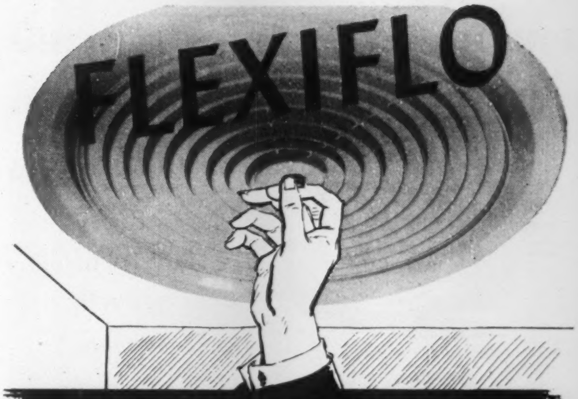
166 WEST 225th STREET, NEW YORK 63, N.Y.
MEMBER FUEL OIL AND WATER HEATER MANUFACTURERS ASSOCIATION



THE DIFFUSER WITH A BUILT-IN VOLUME CONTROL

Flexiflo adjustable air diffusers reduce installation costs by providing for rapid, easy adjustment of air volume *and* pattern after installation.

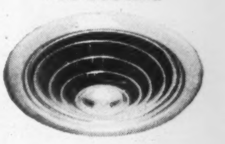
Not only the air volume but also the diffusion pattern is controlled by one knob. Just a half-turn and the push-pull action changes the relative position of the blades, producing the desired result instantaneously.

Engineering is also simplified since the Flexiflo's wide range of adjustability also minimizes the need for specifying exact performance characteristics.

Flexiflo diffusers assure uniform air distribution by using built-in equalizing deflectors which are also easily adjustable after installation. The result is a combination of draftless diffusion with efficient, trouble-free operation.

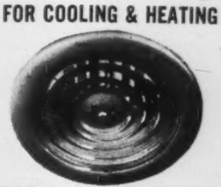
A complete line of Flexiflo diffusers for every cooling, ventilating and heating need is made in 12 standard sizes, up to a capacity of 12,000 CFM.

FOR COOLING



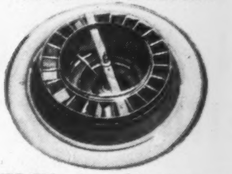
TYPE R—Air travels in a constant pattern parallel to the ceiling regardless of any adjustment in air volume.

FOR COOLING & HEATING



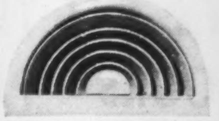
TYPE V—Air diffusion pattern and volume are fully adjustable, after installation, supplying air at any angle.

FOR SUPPLY & RETURN



TYPE CN—A combination supply and return outlet made with either the type R or V blades. Fully adjustable.

FOR SIDEWALL & CEILING



TYPE S—Provided with type R or V blades to blow air in desired pattern for ceiling or wall installation.

Write for technical data catalog on Flexiflo line

FLEXIFLO

Universal Diffuser Corp.
1350 Garrison Ave. • New York 59, N. Y.

LIQUID MATERIALS HANDLING
BLACKMER
PUMPS
1904-1954
50th Year

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story
of
growth

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Blackmer's growth has been earned by the development and manufacture of products backed by 50 years of constant laboratory and field research. These products include industrial bulk pumps, truck pumps, hand pumps, strainers and fluid motors. Blackmer's advanced design, smooth operation, economy, and flexibility of use . . . have been performance proved throughout the last half century. Wherever liquids are handled, Blackmer pumps are known for quality, dependability and record durability. And now, new products soon to be announced promise a new standard of performance. Our engineers can solve your liquid materials handling problems . . . write for details today!

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See Yellow pages for your local sales representative

NEW BOOKS & REPORTS . . .

[Continued]

dential building will be covered by the third portion of the code now in preparation. The first portion dealt with one and two family dwelling units.

The latest code covers space requirements, structural requirements, fire safety requirements and equipment requirements.

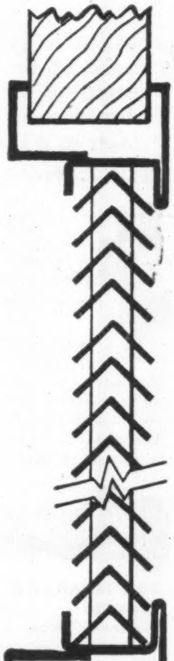
The State Building Code Commission is located at 1740 Broadway, New York 19.

Chromium-Molybdenum Steel Properties

Report on the Elevated-Temperature Properties of Chromium-Molybdenum Steels is the second in a current series of reports prepared under the auspices of the Data and Publications Panel of the ASTM-ASME Joint Committee on Effect of Temperature and the Properties of Metals. This report is a graphical summary of the elevated-temperature strength data for the chromium-molybdenum steels. It includes summary curves for tensile strength; 0.2 percent offset yield strength; percent elongation and reduction of area; stresses for rupture, creep rates and Larson-Miller master curves.

The appendix contains the primary data from which the summary curves were prepared. The data sheets also include the chemical composition, processing data, heat treatment, and other pertinent information about the steels included in this survey. More than 250 data sheets for 52 steels are included.

- CUTS INSTALLATION TIME OVER ½!
- EASY TO INSTALL *Anyone Can Do It!*
- COMPLETE—NO WOOD MOLDINGS TO ADD!



NEW! THIN CORE GRILLE FOR DOORS – PARTITIONS ¼" to ¾" THICK!

First Grille ever designed specifically for thin doors and partitions. Anyone can install it in just a few minutes time. No close tolerances required . . . almost a half-inch extra on sides for positioning. Telescoping auxiliary frame fastens to grille with posts and screws. Clamps tight. No holes to position. Practically no danger of ruining door. No wood moldings. All steel. Rattle-proof. No vision, with 80% free area. Available with or without frame, all sizes. Gray or tan prime coated, or Hammertone finish in gray or bronze.

→
ACTUAL SIZE Cross Section

WRITE FOR OUR COMPLETE
FREE CATALOG
Listing Over 1000 Types and Sizes of Grilles for Every Requirement

A-J MANUFACTURING CO.
Dept. H3 - 2119 Washington St. - Kansas City, Mo.

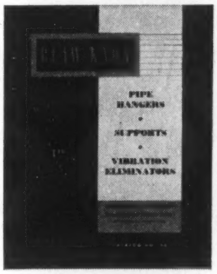
ready-made hangers and eliminators

give you custom-made results

When you use our functional spring hangers . . . which have the Blaw-Knox patented *internal swivel action* . . . and our vibration eliminators, you get custom-made results. And that holds good for rigid hanger assemblies and overhead roller assemblies.

Each is a complete unit, designed to serve a particular purpose, so that proper selection cuts your engineering time and expense . . . yet enables you to meet the most exacting standards. And each is ready to install so that you eliminate expensive cutting, threading and assembling in the field.

Our engineers, who have solved many tough hanger and piping vibration problems, are always available to design and make recommendations for your hanger requirements.



BLAW-KNOX
PIPE HANGERS
•
SUPPORTS
•
VIBRATION ELIMINATORS

Write for your copy of Bulletin No. 54 to get more information on our complete line of hangers, supports and eliminators.

BLAW-KNOX COMPANY
Power Piping and Sprinkler Division
Pittsburgh 33, Pennsylvania

BLAW-KNOX

PIPE HANGERS

Complete line of functional spring hangers • rigid hanger assemblies • overhead roller assemblies • supports • vibration eliminators . . . plus complete prefabricated power piping systems for all pressures and temperatures

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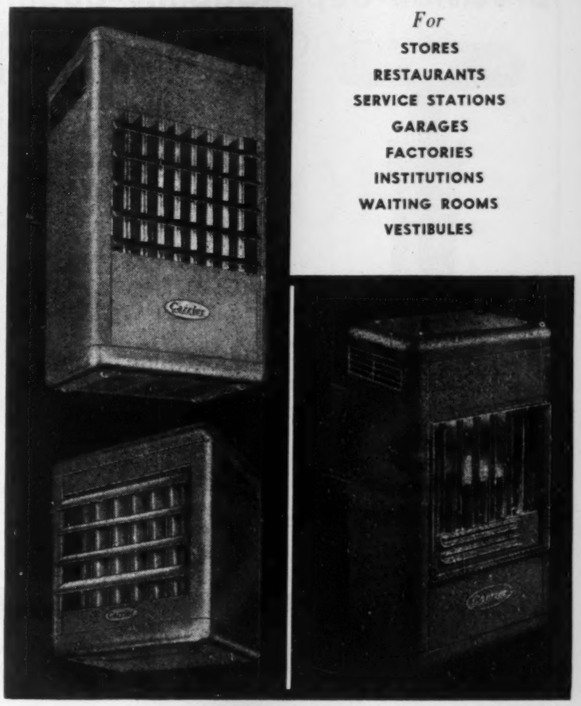
Carrier Engineered means foremost in Unit Heaters



For
STORES
RESTAURANTS
SERVICE STATIONS
GARAGES
FACTORIES
INSTITUTIONS
WAITING ROOMS
VESTIBULES

(Propeller-fan models at left; duct type at right)

A type and size for every need
. . . from 50,000 to 230,000 Btu per hour input

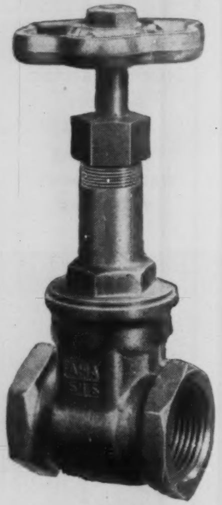
You can be sure that Carrier engineering spares nothing toward assuring easy Unit Heater installation, utmost operating efficiency, dependable safety and temperature controls—*plus* the longest-lasting construction to be found in any products of the kind. Carrier features (to mention a few) include:

- Heavy-gauge steel casing, die-formed, Bonderized, durably gray-enameled.
- Internal radiation sheets. Built-in draft diverter. Adjustable air-discharge louvres.
- Heat exchanger (the "heart") of durable, corrosion-resisting ALUMINIZED STEEL. (Its *16* gauge is exclusive in these Carrier units and is far longer-lasting than ordinary furnace steel of heavier gauge.)
- Heavy-wall cast-iron burners with accurately drilled ports.
- Automatic pilot safety and fan control switches. High temperature limit control.
- Adapted to all types of gas (AGA-approved).

To jobbers and installers: For details on extra-profit opportunities under protected franchise, WRITE to Carrier Corporation, Syracuse, New York.

Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL HEATING



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precision-dependability-quality

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THREEWAY COCKS
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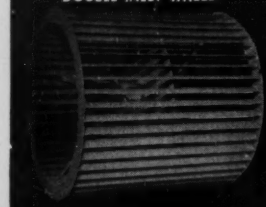
Ask your jobber, or write
Dahl Bros., today.

Brass Gate Valve
with Rising Stem
No. 14055

DAHL BROTHERS (Canada) Limited
29 Melinda Street Toronto, Ont.

DOUBLE INLET WHEEL



BACKWARDLY
CURVED WHEEL

SINGLE INLET
WHEEL

BARRY
BLOWER WHEELS

INDUSTRIAL BLOWER WHEELS BUILT TO YOUR SPECIFICATIONS

Barry blower wheels assure smooth long lasting service. Each wheel precisely built, expertly trued and perfectly balanced by a company manufacturing blower wheels exclusively. Prompt delivery on any type heavy duty industrial blower wheel from 6″ to 72″ diameter. Send your specifications and we shall be pleased to quote immediately. Barry Blower Co., 3100 California St., N.E., Minneapolis 18, Minnesota.

NEW BOOKS & REPORTS . . .

[Continued]

Copies of this 212-page report can be obtained from headquarters of the American Society for Testing Materials, 1916 Race St., Philadelphia 3, at $4.75 each, in a heavy paper cover.

OTHER BOOKS & REPORTS . . .

HOW TO ATTRACT AND HOLD ENGINEERING TALENT—results of a research survey of engineering employees and management dealing with recruiting techniques, professional status, benefits and incentives, unions and recommendations for attracting and holding engineering talent.

The report was prepared by the Professional Engineers Conference Board for Industry, 1121 15th St., N.W., Washington 5, D.C., in cooperation with the National Society for Professional Engineers. Single copies are $2.00.

LP GAS—SAFE HANDLING and USE—information for the public, vendors and industrial plants on how the inherent hazards of liquefied petroleum gas can be safely controlled. The 60-page pamphlet contains tables and diagrams for computing maximum liquid volumes and filling densities for LP gas containers. Composition, properties and behavior of the gas are described.

Prepared by the Association of Casualty & Surety Companies, 60 John St., New York 38, copies may be obtained from any of the member companies or from the association at 25 cents a copy.

YOU make the
Heating and Air Conditioning Equipment

CORNISH makes the
WIRED ASSEMBLIES
to speed up your production

Through integrated
engineering and production
control from rod mill to molding,
we produce complete QUALITY
units at lower cost ———

"MADE BY ENGINEERS FOR ENGINEERS"

CORNISH-RUTLAND COMPANY
Rutland, Vermont

General Clay

answers the questions everybody is asking about

RADIO FREE EUROPE

General Lucius D. Clay, former U. S. Military Governor in Germany, and leader of the Berlin Airlift, was first Chairman of the Crusade for Freedom.

General Lucius D. Clay answers nine vital questions about an organization which needs your dollars and your support—Radio Free Europe.

RFE is important to *you* and to millions of freedom-loving people behind the Iron Curtain, *who are our first line of defense against Soviet aggression.* General Clay tells why:

Q. What is "Radio Free Europe"?

A. Actually, it is 6 stations in Western Europe broadcasting TRUTH through the "Iron Curtain" to the people of 6 captive countries in their own tongues and in the voices of their own known and trusted exiles.

Q. What is the difference between Radio Free Europe and the Voice of America?

A. The Voice of America is run and paid for by the Government. Radio Free Europe is operated as an independent American enterprise by a committee of private citizens. It is *people* talking to *people*—Poles telling the truth to Poles, Czechs and Slovaks telling the truth to Czechs and Slovaks, etc. It is not bound by diplomatic limitations.

The Voice of America broadcasts to many countries and can only devote a limited amount of time each day to any one country. But Radio Free Europe's "Voice of Free Czechoslovakia", for example, broadcasts about 20 hours each day to Czechoslovakia alone.

Q. Who supports Radio Free Europe?

A. Millions of American citizens like yourself, through voluntary contributions of millions of dollars! More than 1,000 carefully screened people man the stations. The management is American, but the staff is largely composed of editors, reporters, teachers, clergymen and entertainers who have come from behind the Iron Curtain.

Q. What countries does Radio Free Europe reach?

A. Czechoslovakia, Poland, Romania, Bulgaria, Hungary, and Albania with a total of 70,000,000 population.

Q. How does Radio Free Europe get its news?

A. Radio Free Europe monitors most Communist broadcasts. Every program is analyzed by nationals of the captive countries who *know the truth.* Voluminous information from many sources is compiled and evaluated constantly by exiled experts. New exiles bring out new truth daily—and they bring it to RFE.

Q. Are more transmitters needed?

A. Yes. More transmitters and still more transmitters are needed now to let truth speak louder than ever to those captive people. Transmitters in new locations are needed too—as added insurance that this "Voice of Freedom" will never be stilled. Each new transmitter insures a new listening position on a captive radio dial.

Q. How much is needed now?

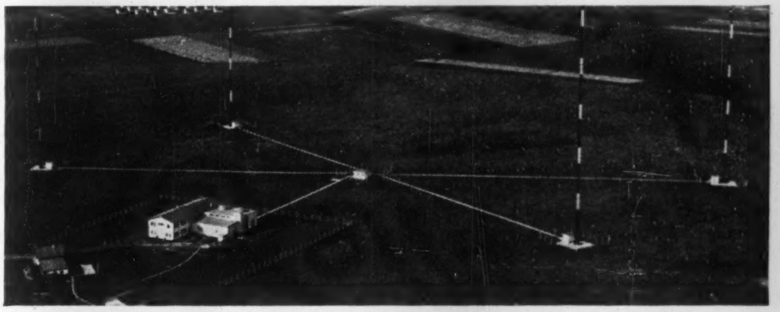
A. At least $10,000,000. But, as important as the money, the WIDEST POSSIBLE PARTICIPATION—to communicate the truest possible feeling of FRIENDSHIP FROM MILLIONS OF AMERICAN PEOPLE IN ALL WALKS OF LIFE.

Q. How much should one individual give?

A. All he can . . . A "truth dollar" is suggested.

Q. Why is Radio Free Europe so important to me?

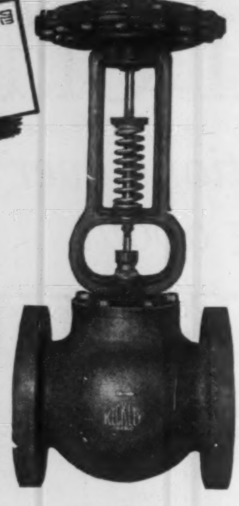
A. Because it is devoted to the single most important job in the world—to help keep World War III from happening. If 70,000,000 people in the six Iron Curtain countries continue to resist Soviet tyranny, the Kremlin is kept off balance in one of the most strategically sensitive areas in the world.



This transmitter at Holzkirchen, Germany, is the largest of Radio Free Europe's 21 outlets. It has brought protests from angry Communists in Czechoslovakia where it is beamed 20 hours a day.

A PUBLIC SERVICE PROJECT · THE ADVERTISING COUNCIL

RADIO FREE EUROPE *supported by* **CRUSADE FOR FREEDOM**



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DELIVERY

of the reduced pressure you want!

. . . with this STANDARD valve

Here is a standard diaphragm regulator that can handle your special pressure control requirements. It is furnished in a wide range of sizes, types (self-contained, instrument or pilot control), bodies, and trim, to your specification. For water, oil, steam, air or gas. No. 119 single seated, No. 114 double seated, sizes ½" to 6", screwed, standard or extra heavy flanged. Direct or reverse acting. Tested and approved by leading engineers and contractors — the answer to your regulator problems.

No. 114 & No. 119 REGULATOR

- Pressures to 300 psi reduced to zero.
- Bronze, semi-steel or steel bodies
- Spring loaded, interchangeable diaphragms
- For water, oil, steam, air or gas

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pressure regulators • float boxes
temperature regulators
pop safety valves • relief valves
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1914 **O. C. KECKLEY CO.** 1954
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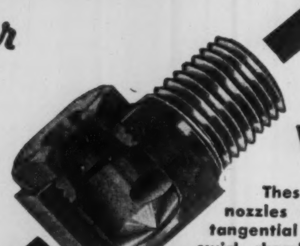

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NOZZLES
for
AIR WASHERS

These are "non-clogging" nozzles with a single large tangential lead hole to the swirl chamber that will never clog from any impurities small enough to pass through the orifice. Swirl chamber is conical on both ends and pivots liquid like a top to produce an exceptionally fine, evenly distributed, balanced spray of about 80° included angle. Wider spray angles up to 130° can be furnished to order.

Standard material Brass. Also available in Stainless Steel and Monel. Pipe sizes from ⅛" to 1". ¼" size is 1-5/16" long and made from ⅝" square stock.

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MEETINGS & CONVENTIONS...

IBR SCHOOL OF MODERN HEATING — March 9-11, Albany, N. Y., Odd Fellows Hall, 46-48 Beaver St.; March 16-18, Newark, N. J., Public Service Auditorium, 70 Park Pl.; March 23-25, Richmond, Va.; March 30-April 1, Norfolk, Va.; April 6-8, Philadelphia.

Tuition for the IBR School is $28.00. Students wishing further information may obtain it from the Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17.

REFRIGERATION AND AIR CONDITIONING CONTRACTORS ASSOC., 2108 Keith Bldg., Cleveland 15—Regional convention for west coast members, March 11-13, California Municipal Auditorium, Long Beach. It will be held in conjunction with the *ARI* Educational Conference.

AIR CONDITIONING AND REFRIGERATION INSTITUTE, 1346 Connecticut Ave., N.W., Washington 6, D.C.—Educational Conference on air conditioning and commercial refrigeration, March 11-13, Long Beach, Calif.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 1061 M & M Bldg., Houston 2—Tenth Annual Conference and Exhibition, March 15 to 19, Kansas

Preference is for JEFFERSON UNIONS because:

. . . they are easier to set up and permanently leakproof

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. . . leakproof tightness assured by a true spherical brass seat recessed to avoid pipe ends ever coming in contact with it.

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The PETROMETER Tank Gauge offers you the convenience of Remote Reading plus these four extra features:

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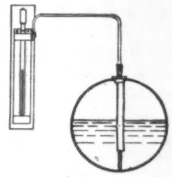
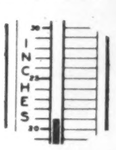
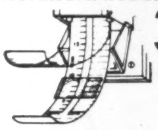


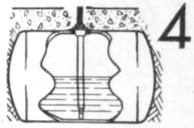
CONSTANT ACCURACY • • • The large vertical scale on the Petrometer gives you constant, accurate readings. The red liquid column is clearly visible—moves up and down as contents vary, just like the liquid level in your tank.



INTERCHANGEABLE SCALES • • • The scale on the Petrometer is readily removed or adjusted to correct for tank pitch or when changing liquids. No tools are needed.



EASY INSTALLATION • • • Gauges can be installed on tanks above or below the ground and up to ¼ mile away. The tank assembly for the gauge can be installed even when the tank contains liquid. It can also be fitted in the tank separately to complete the tank work and the gauge connected any time later. Just tighten one simple connection and installation is complete.



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7

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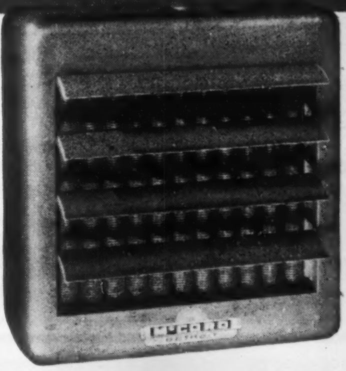
HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS



Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

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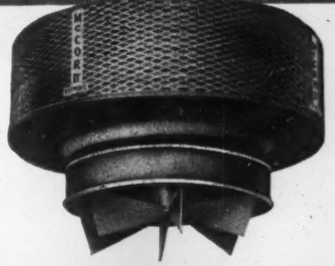

A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

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TURBINE VENTILATORS

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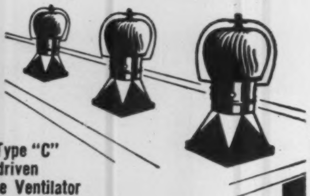
Allen Type "C"
Wind-driven
Turbine Ventilator



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Roof Ventilators for Every Commercial and Industrial Need

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There is a DELAVAN NOZZLE for any flow rate from 2 quarts per hour to 63 gallons per minute.
Type WD — ideal for obtaining finest possible pressure atomization.
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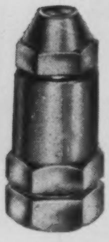
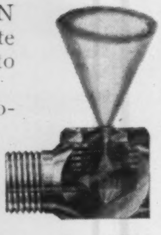
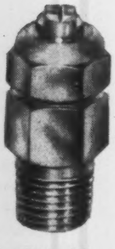


Type WD



Type WR

Type WS



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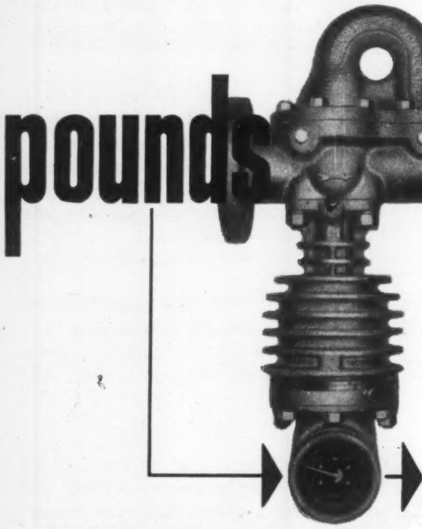
MEETINGS & CONVENTIONS . . .

[*Continued*]

City, Mo. Co-chairmen are F. L. Whitney, Jr., Monsanto Chemical Co., St. Louis, and H. L. Bilhartz, the Atlantic Refining Co., Dallas.

AMERICAN POWER CONFERENCE, Illinois Institute of Technology, Technology Center, Chicago 16—16th Annual Meeting, March 24-26, Sherman Hotel, Chicago. The conference is sponsored by IIT in cooperation with 12 universities and 10 local and national engineering societies. Of special interest are the following topics:

Scale Modeling — A Practical Engineering and Construction Tool, by James A. Carroll, The Procter and Gamble Co.; *Selection, Maintenance, and Piping Practice in Industrial Plants*, Robert J. Pinske, The Crane Co.; *Recent Development in Pipeline Electrification*, Merritt Hyde, Westinghouse Electric Corp.; *Factors Affecting the Installation of Year Round Air Conditioning in Homes*, Lawrence H. Hirschbach, General Electric Co.; *Climatic and Geographic Evaluation of Potential Comfort Air Conditioning Loads*, John R. Hertzler and V. T. Kartorie, York Corp.; *Evaluation of Several Alkaline Compounds for Controlling Corrosion in Boiler Feedwater Systems*, J. M. Decker and J. C. Marsh, Detroit Edison Co.; *High Temperature Water for Process Heating Combined with Power Production*, Paul L. Geiringer and Floyd Hasselriis, American Hydrotherm Corp.; *Symposium on Demineralization; Technology of the Use of High Pressure Water for Reactors*, A. Amorosi, Argonne National Laboratory; *Boilers and Boiler Waters — Interlocking Advances in Design*, H. M. Rivers and S. R. Osborne, Hall Laboratories; *Silica Removal by Salt Splitting without Demineralizing*, S. B. Applebaum, Cochrane Corp., and B. W. Dickerson, Hercules Powder Co.; *Some Chemical Aspects of Hot Process-Hot Zeolite Plant Performance*, M. Lane and J. H. Duff, Graver Water



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New COOK Blower Ventilators

Backwardly-inclined impeller, non-overloading

★ All-aluminum
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★ Motor sealed from air stream
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WALL or KITCHEN EXHAUST — complete assembly is easily adjustable to wall thickness. In 7", 9" and 10" sizes. Model W.

ROOF VENTILATOR, Model BV, direct drive, 9" to 21", 400 to 5000 cfm.

ROOF VENTILATOR in 7", 9" and 10" sizes. Base fits 6" and 8" pipe. Handsome interior grille with this and above model. Model R.

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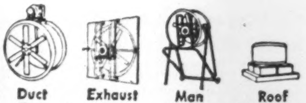

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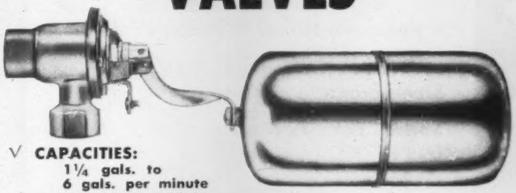

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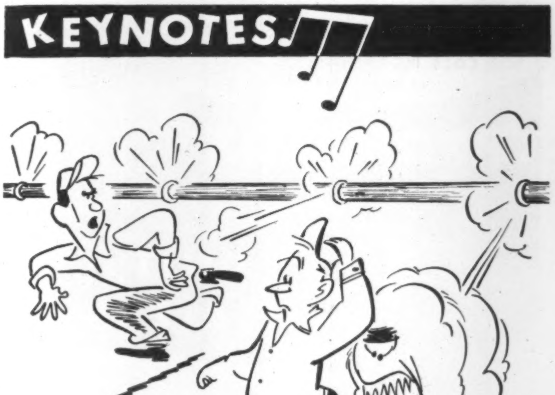

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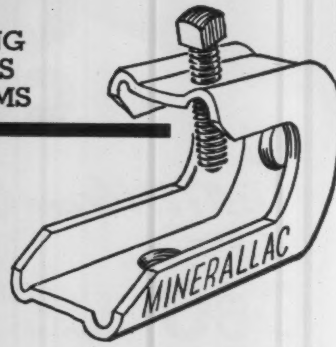

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MEETINGS & CONVENTIONS . . .

[Continued]

Conditioning Co.; *Some Economic Factors Influencing Industrial Boiler Manufacture,* Carl E. Miller, Combustion Engineering, Inc.; *Industrial Operating Experience with Cyclone Fired Boilers,* Leo L. Moran, The Dow Chemical Co.

Further information is available from E. R. Whitehead, secretary of the conference, at the Technology Center.

The *NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOC.* has announced the schedule of the remaining college short courses for 1954. The dates, locations and names of the persons to be contacted for reservations are:

March 29-April 1, Michigan State College, Prof. C. H. Pesterfield, Mechanical Engrg. Dept., East Lansing; April 14-17, Penn State College, T. A. Wright, Room 103, Mechanical Engrg. Dept., State College, Pa.; April 19-21, Syracuse University, Prof. J. A. King, Mechanical Engrg. Dept., Syracuse, N.Y.; April 21-24, Iowa State College, Prof. Marvin Gould, Engrg. Extension Service, Ames; July 13-16, University of Wisconsin, Prof. R. C. Tegtmeyer, Mechanical Engrg. Dept., Madison.

Each course will present basic problems in combination heating and cooling and problems in advanced heating or advanced air conditioning. Commercial heating and cooling will be covered. The general fee for each school is $25.00.

1954 *SOUTHERN INDUSTRIAL WASTES CONFERENCE*—April 21-23, Hotel Shamrock, Houston, Texas.

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CHROMALOX Unit Heaters quickly and economically give needed warmth wherever heat is required. Air is forced across CHROMALOX Finstrip elements by a quiet fan and directed into the desired areas by adjustable louvers. High velocity discharge assures adequate supply of heated air. Units are available with manual or automatic controls in 1.5 to 15 KW. capacities.

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balance rotating parts weighing from 4 oz. to 8 tons

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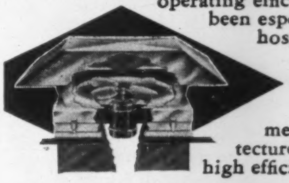

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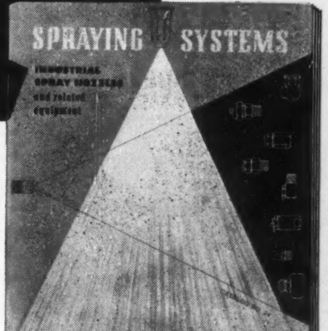

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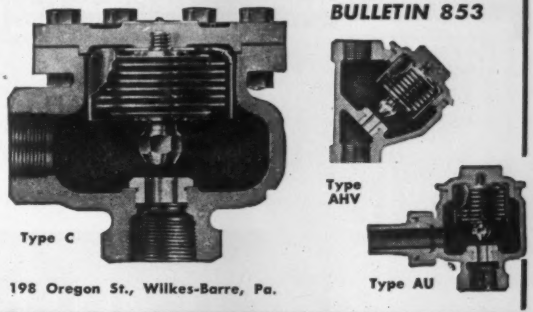
BULLETIN 853



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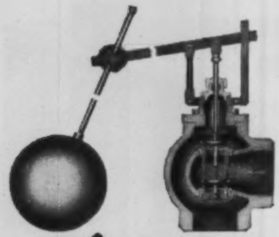

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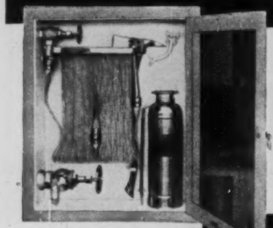

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MEETINGS & CONVENTIONS . . .

[Continued]

The conference is being sponsored jointly by the Manufacturing Chemists Association, the Southern Association of Science and Industry, and the Texas Chemical Council. The program will cover air and stream pollution problems including managerial as well as technical aspects. Conference chairman is L. L. Hedgepeth, American Cyanamid Co., Bound Brook, N. J.

AMERICAN INDUSTRIAL HYGIENE ASSOC., 205 N. LaSalle St., Chicago 1—1954 Industrial Health Conference, April 26-30, Hotel Sherman, Chicago.

AMERICAN WELDING SOCIETY, 33 W. 39th St., New York 18—1954 National Spring Technical Meeting, May 4-7, Hotel Statler, Buffalo, N.Y. The 1954 Welding and Allied Industry Exposition will be held at the Buffalo Memorial Auditorium, May 5-8.

SHEET METAL CONTRACTORS NATIONAL ASSOC., 170 Division St., Elgin, Ill.—11th Annual Convention, May 10-12, William Penn Hotel, Pittsburgh. J. D. Wilder is executive secretary of the association.

MICHIGAN ENGINEERING SOCIETY—1954 Convention, May 7-8. Jackson. J. E. Wilbur is executive secretary.

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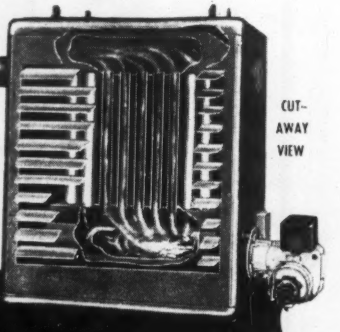

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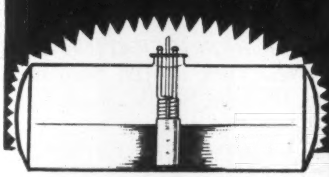
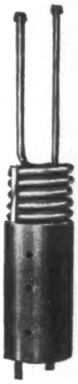
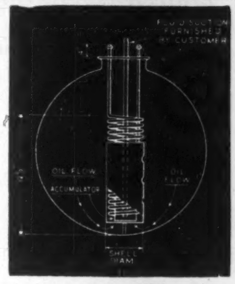
PREHEAT HEAVY OILS IN STORAGE TANKS



REMPE

"Hot Spot" PREHEATER





Preheats fuel oils and other liquids to proper flow temperature before entering the suction line.

No. 5 and Bunker C oils flow more freely at high temperatures—have greater BTU value. The Rempe "Hot-Spot" does the preheating job efficiently. Takes the load off the suction pump. All-steel construction. Inlet and outlet pipes furnished in required lengths for any diameter tank. Steam or Hot Water can be used as heat source. Made with 14" or 16" diameter shell. *Complete facilities for fabrication of pipe coils — all types — all materials. Engineering service. Send details for price.*

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REMPE COMPANY

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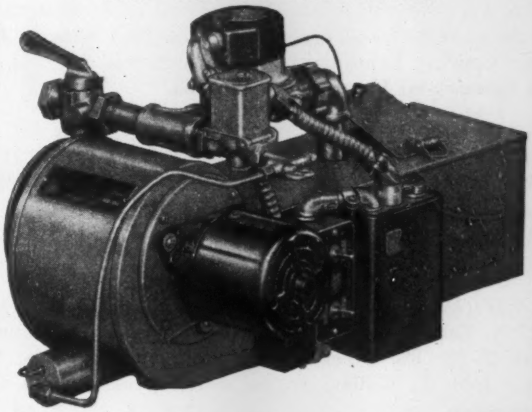
LATEST MODEL FEATURES NEW AUTOMATIC SAFETY PILOT and TRIPLE CONTROLS



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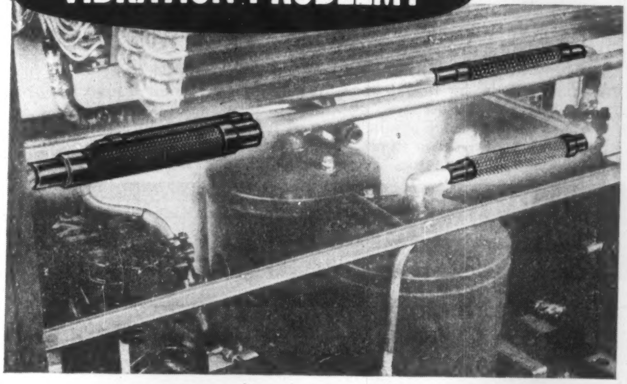

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MEETINGS & CONVENTIONS . . .

[Continued]

OIL HEAT INSTITUTE OF AMERICA, INC., 500 Fifth Ave., New York 36—32nd annual convention, May 16-20, to be held concurrently with the 1954 National Indoor Comfort Exposition. Both events will be held at the Commercial Museum, Philadelphia.

HEATING, PIPING AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOC., Suite 1843, Rockefeller Plaza, New York 20—65th annual convention, May 24 to 28, Hotel Traymore, Atlantic City, N.J.

NATIONAL DISTRICT HEATING ASSOCIATION, 827 N. Euclid Ave., Pittsburgh 6—45th Annual Meeting, May 25-28, The Greenbrier, White Sulphur Springs, W. Va. John F. Collins, Jr., is secretary-treasurer of the association.

CONFERENCE ON INSTRUMENTATION IN WATER, SEWAGE AND INDUSTRIAL WASTE TREATMENT, sponsored by the Civil Engineering Dept., Manhattan College, 242nd St. and Broadway, New York 71, April 22. The program will include technical papers, discussions and instrument exhibits.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 62 Worth St., New York 13—Semi-Annual Meeting, June 28-30, New Ocean House, Swampscott, Mass.

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS, 234 Fifth Ave., New York 1—41st Semi-annual Meeting, July 11-14, Hotel Olympic, Seattle, Wash.

EIGHTH NATIONAL CHEMICAL EXPOSITION, The American Chemical Society, Chicago Section, 86 E. Randolph St., Chicago 1—Chicago Coliseum, October 12-15. Theme of the Exposition is, "The Chemical Industry in Everyday Living."

21st NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING, under the management of the International Exposition Co., 480 Lexington Ave., New York 17—Commercial Museum, Philadelphia, December 2-7.

INTERNATIONAL HEATING & VENTILATING EXPOSITION—The Air Conditioning Exposition, January 24-28, 1955, Commercial Museum & Convention Hall, Philadelphia. Under the auspices of the American Society of Heating and Ventilating Engineers, and under the management of the International Exposition Co., 480 Lexington Ave., New York 17.

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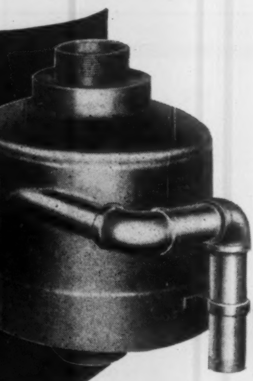
BLOWDOWN
SEPARATORS



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Installation of separators can be made wherever convenient—at the boiler, on boiler house roof, or outside the boiler house walls. Size of boiler blowdown connection determines which of two models (shown in Bulletin 30) is required. Separators are used, instead of blowdown tanks, in 47 states, foreign countries, and overseas military bases.

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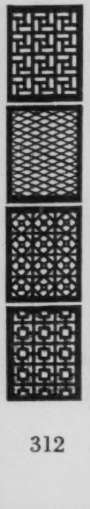

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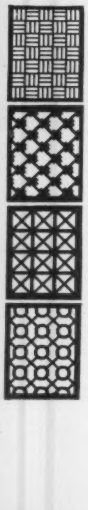

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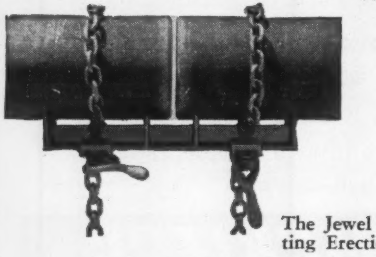

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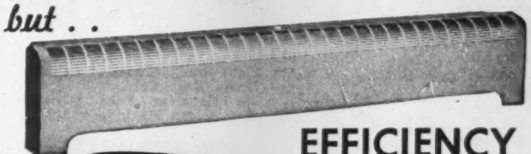

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POSITION WANTED — Registered Professional Mechanical Engineer licensed by examination in Illinois; specialist with 17 years experience in design and installation of heating, ventilating, air conditioning and refrigeration systems for schools, hospitals, and office buildings. Prefers position in a smaller community of approximately 50,000 to 100,000. Three years experience purchasing steel and tools at large ordnance plant during war prior to service in Navy electronics. 43, married, native born, protestant, employed but available for an interview or will send additional facts by mail. Address Key 1082A, Heating, Piping & Air Conditioning, 6 North Michigan Avenue, Chicago 2, Illinois.

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WANTED — MECHANICAL ENGINEER with at least ten years experience in the operation and maintenance of refrigeration equipment and air handling equipment for position as Building Engineer to operate "heat pump" system in largest office building in New Mexico. College graduate preferable but not essential. In reply give full details regarding experience, education and salary expected. SAVAGE & SGANZINI, 215 Fourth St., S.W., Albuquerque, N. M.

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MANUFACTURER'S AGENTS required by prominent manufacturer of Convector Radiators, Steam, Gas and Oil-Fired Unit Heaters. Must be well established. Territories open in several sections of United States. AIRTHERM Manufacturing Company, 700 South Spring Avenue, St. Louis 10, Missouri.

Manufacturers' Agents required by established manufacturer of fans and blowers. Must be well established, calling on industrials, contractors, engineers. Fan experience preferable. Protected territories are open for Nashville, Memphis, Knoxville, Chattanooga, Tenn., Cincinnati, Ohio, Pittsburgh, Pennsylvania. General Blower Co., 8610 Ferris Avenue, Morton Grove, Illinois.

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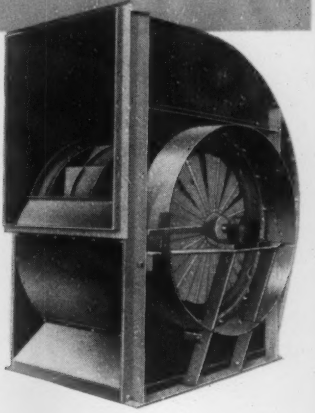

operating 29 years and STILL GOING STRONG

Clarage equipment at the Palmer House

Interesting Facts about this installation as published in Clarage advertising in 1925...

Architects and engineers for the new Palmer House are Holabird & Roche, Chicago. Clarage Equipment purchased by Phillips Getschow Co., Chicago. Clarage Apparatus when completely installed will comprise what is undoubtedly the world's largest ventilating installation. Supply fans deliver 19.35 tons of air per minute, exhaust fans handle 25.7 tons of air per minute, while the washers use 3,700 gallons of water per minute.

"The original Clarage fan equipment is still in operation and of course has been entirely satisfactory."

. . . so reports C. D. Willingham, building superintendent at Chicago's famed Palmer House.

It was in 1925 that the present Palmer House was built — replacing its historically famous predecessor.

The 52 Clarage fans and 22 Clarage air washers installed in this hotel have been **on the job for 29 years.**

In hotels, in industrial plants, in buildings of all types and sizes — users have found and are finding that Clarage is equipment you can RELY on.

Wherever you are, you're close to a thoroughly capable Clarage application engineering office. Call upon this expert assistance . . . or have us send you literature covering the types of Clarage equipment you're interested in.

CLARAGE FAN COMPANY, Kalamazoo, Michigan.

You can Rely on...
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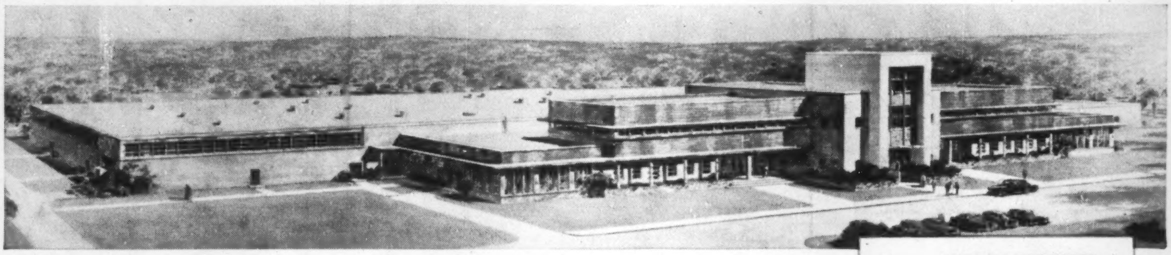
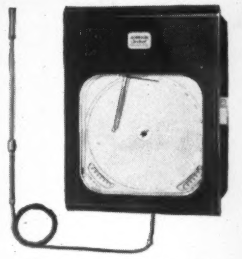
Headquarters for Air Handling and Conditioning Equipment

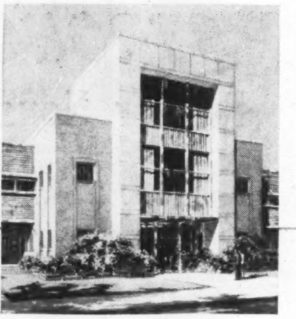
SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • *IN CANADA:* Canada Fans, Ltd., 4285 Richelieu St., Montreal

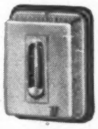




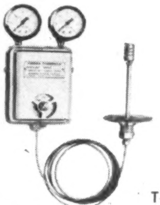
T-1000 Record-O-Stat

Another nationally-known Pharmaceutical Manufacturer chooses JOHNSON CONTROL

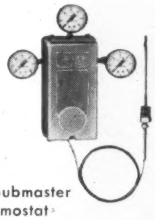




T-315 Submaster Room Thermostat



T-800 Capillary Thermostat



T-901 Submaster Thermostat

D-251 Piston Damper Operator

V-103 Coil Valve

White Laboratories, Inc., Kenilworth, New Jersey. A. M. Kinney, Inc., architects and mechanical engineers, Cincinnati, Ohio; Frank Briscoe Co., Inc., general contractor, Newark, New Jersey; Frank A. McBride Co., heating, ventilating and air conditioning contractor, Paterson, New Jersey.

In the modern new plant of White Laboratories, Inc., diversified control problems are automatically solved with precision by a comprehensive system of Johnson Control. A "Planned-for-the-Purpose" Johnson System automatically regulates temperatures to meet the requirements for processing pharmaceuticals and to insure worker comfort.

In the office section, Johnson Submaster Room Thermostats, reset in accordance with outdoor temperatures, regulate Johnson Double Mixing Dampers to maintain exactly the desired conditions. Throughout the Main Building and in the Chemical Building, Johnson Thermostats control Johnson Valves and Damper Operators on central fan heating and ventilating units.

Much of the processing and many of the manufacturing areas are controlled by Johnson Series T-1000 "Record-O-Stats", temperature controllers which also provide a continuous record of temperatures for future reference. This is important where processes and product quality are dependent upon precise temperatures . . . another outstanding example of the adaptability of Johnson Control.

Whether the solution of your control problem requires the application of a single controller or the installation of an intricate temperature and humidity control *system*, let a Johnson engineer help you. Get the benefit of 65 years of experience by the *only* nationwide organization devoted exclusively to manufacturing, planning and installing automatic temperature and air conditioning control systems. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

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